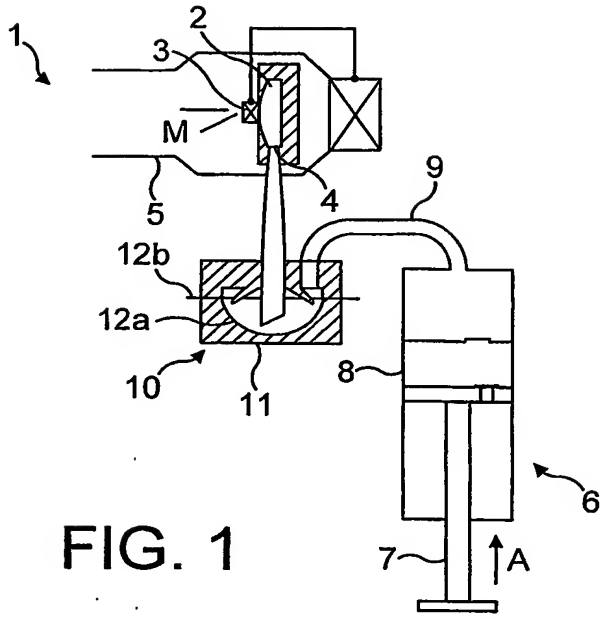


FIG. 1

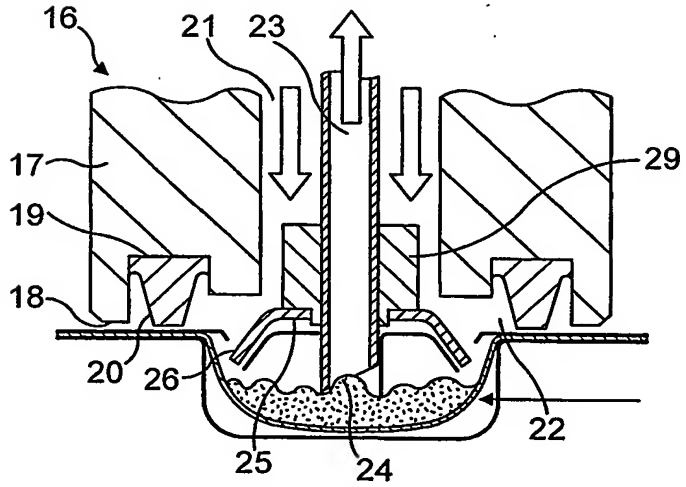


FIG. 2

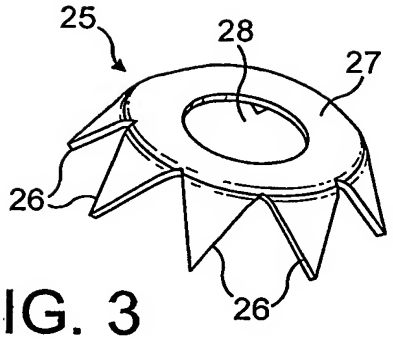


FIG. 3

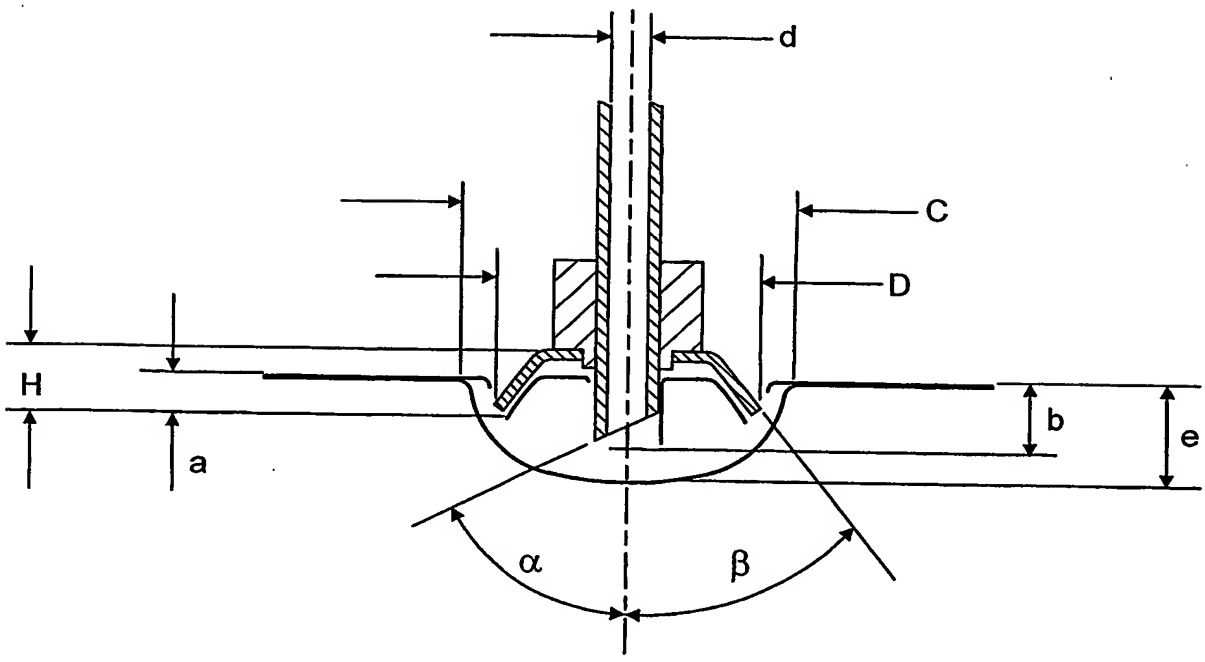


FIG. 4

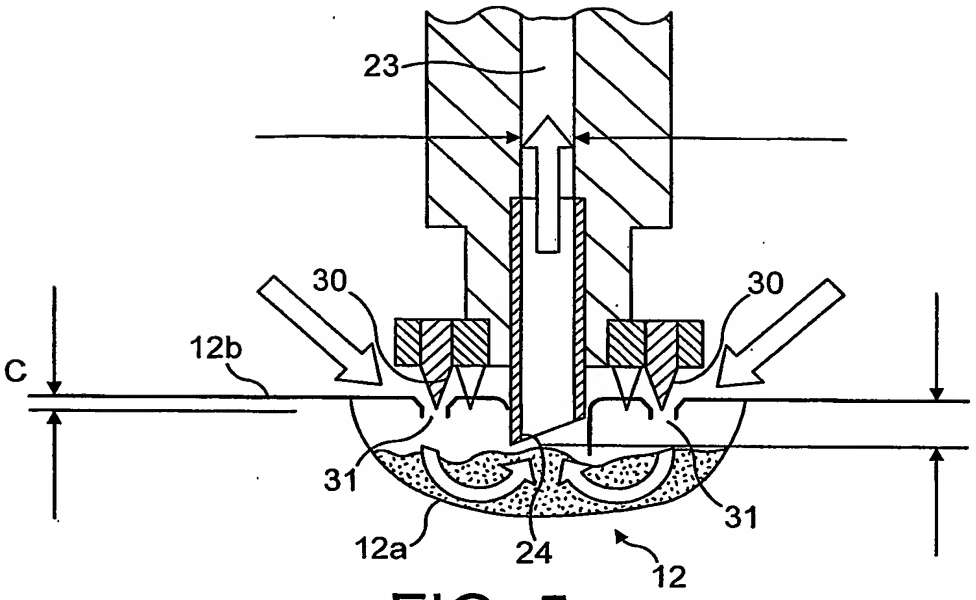


FIG. 5

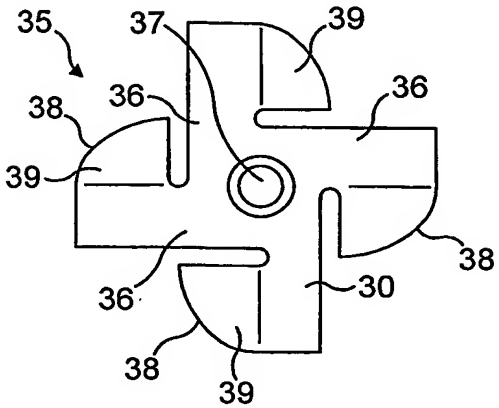


FIG. 6a

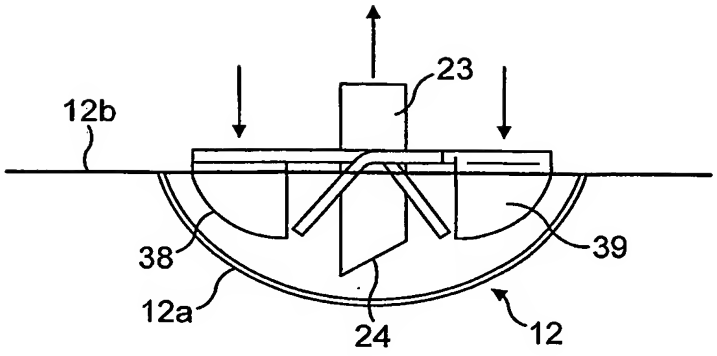


FIG. 6b

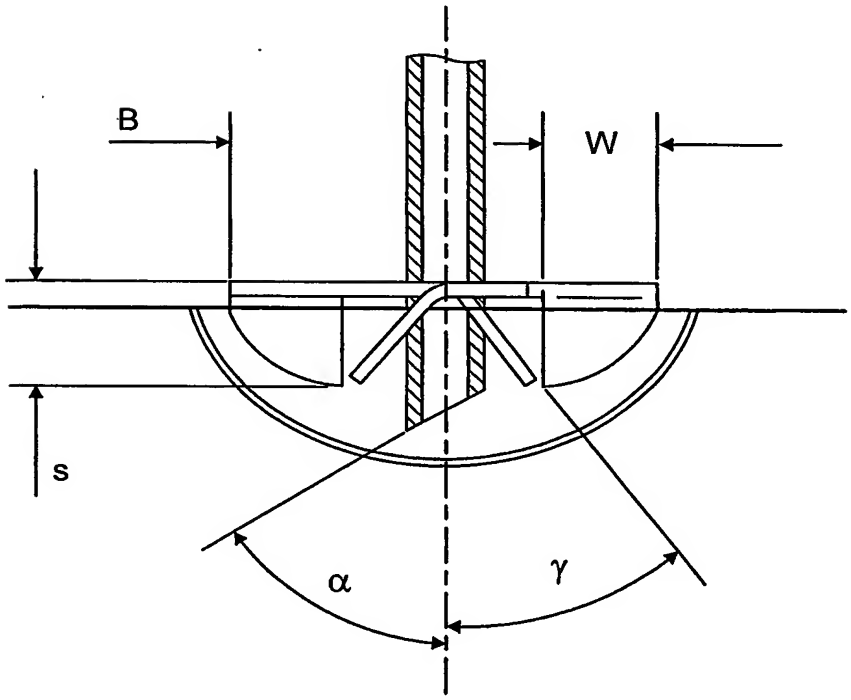


FIG. 6c

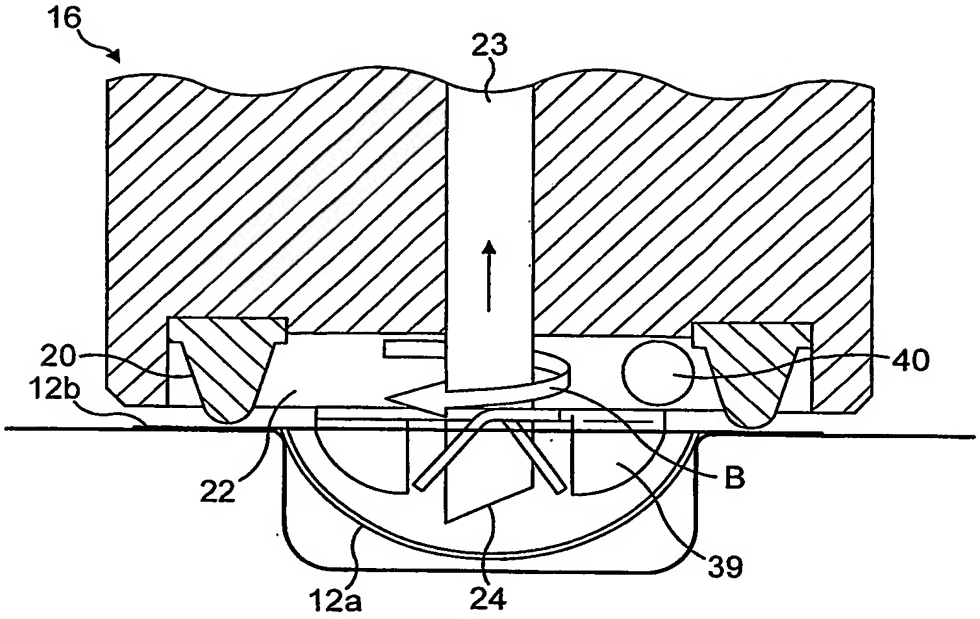


FIG. 7a

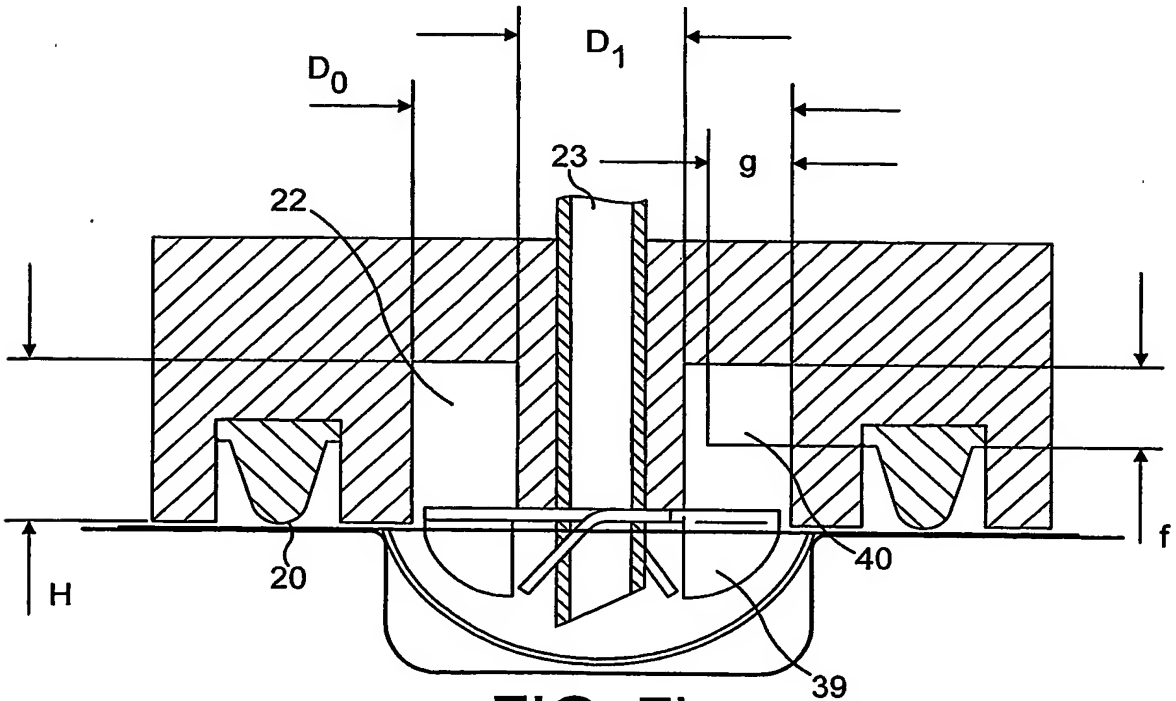


FIG. 7b

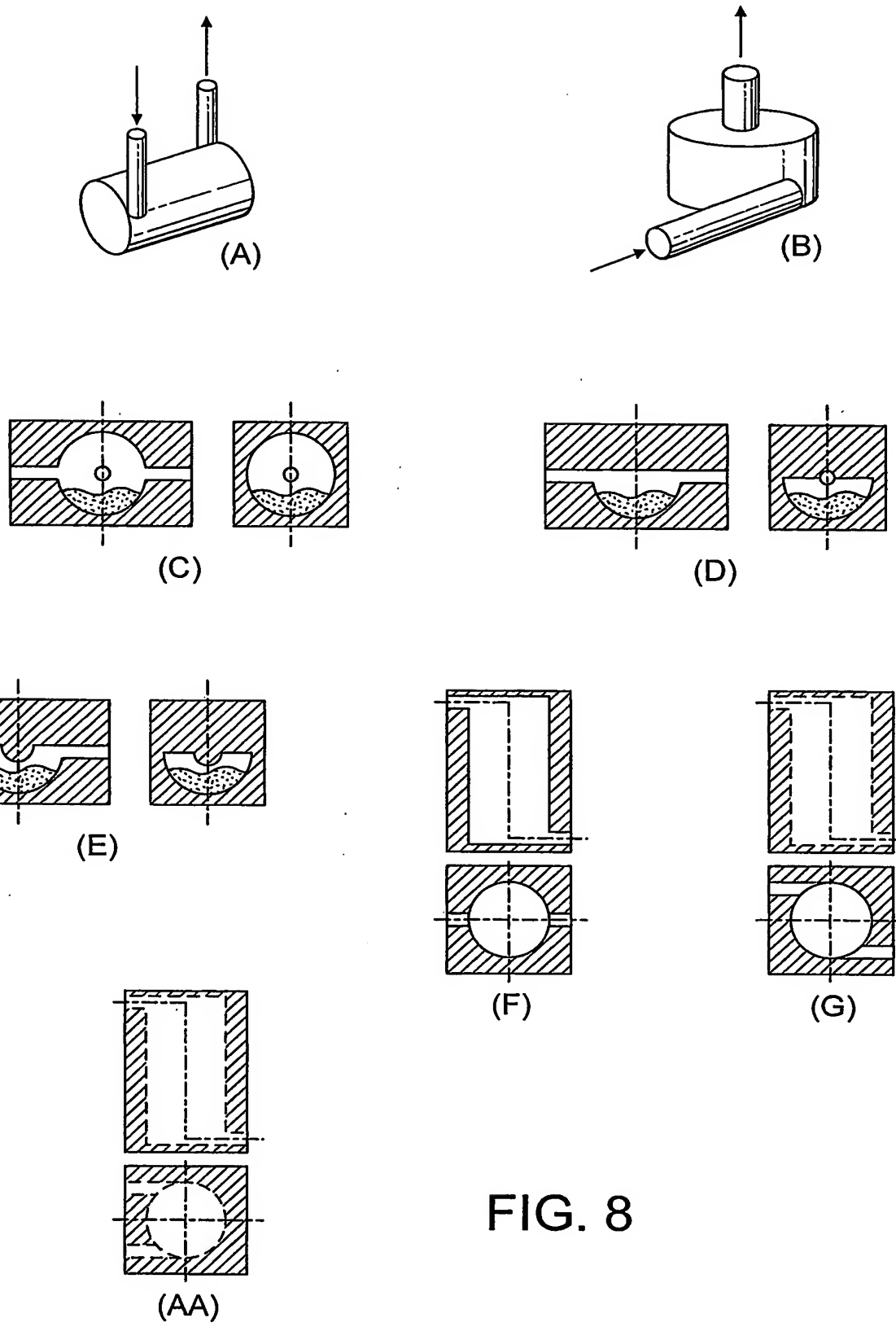


FIG. 8

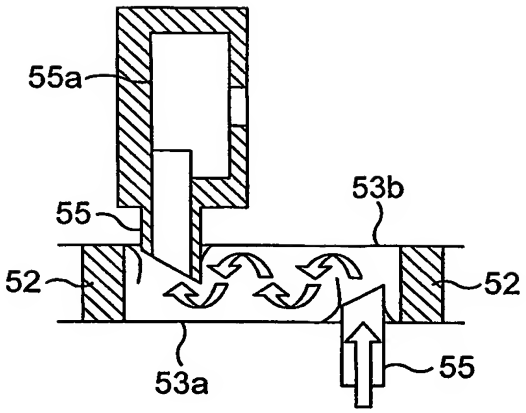

55a
53b
55
52
52
53a
55

FIG. 9

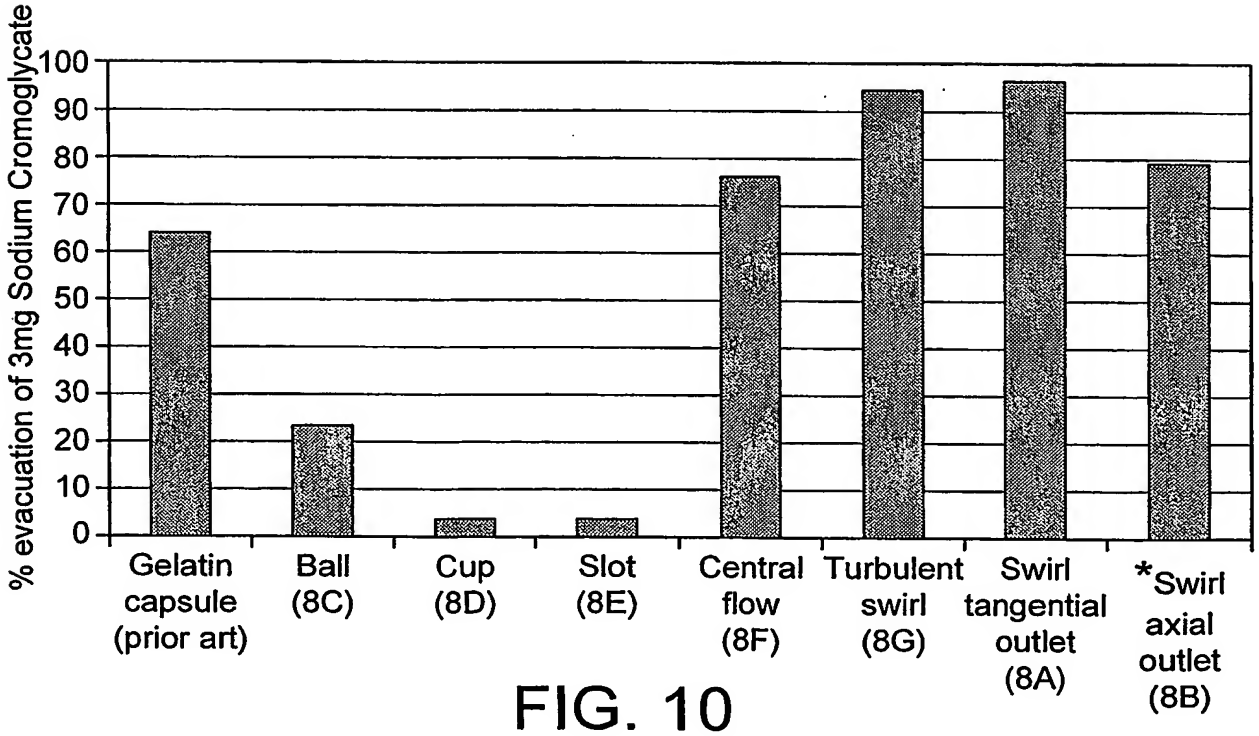
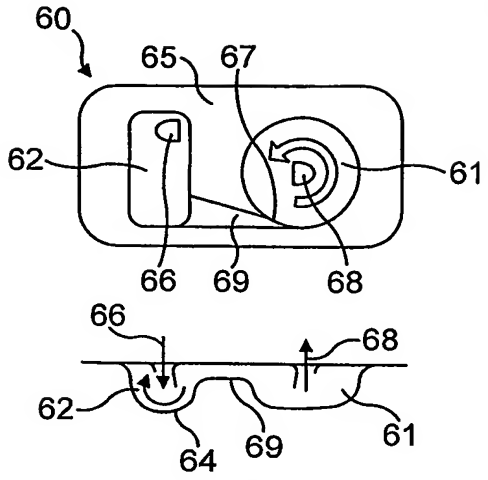
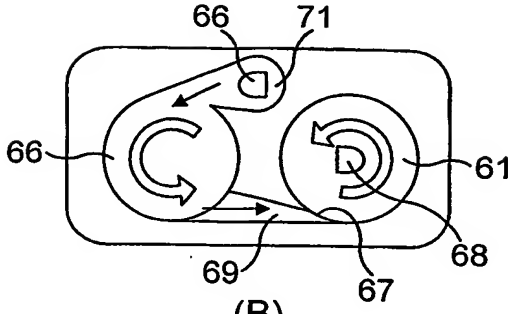

% evacuation of 3mg Sodium Cromoglycate
100
90
80
70
60
50
40
30
20
10
0
Gelatin capsule (prior art)
Ball (8C)
Cup (8D)
Slot (8E)
Central flow (8F)
Turbulent swirl (8G)
Swirl tangential outlet (8A)
*Swirl axial outlet (8B)

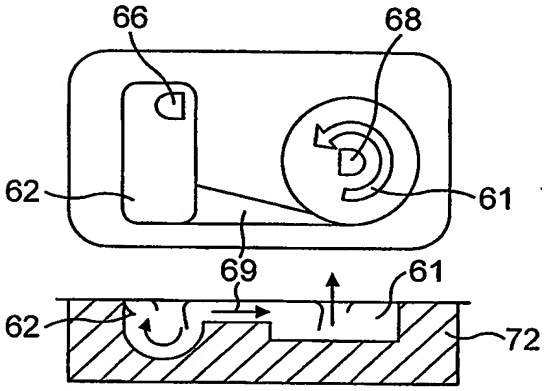
FIG. 10



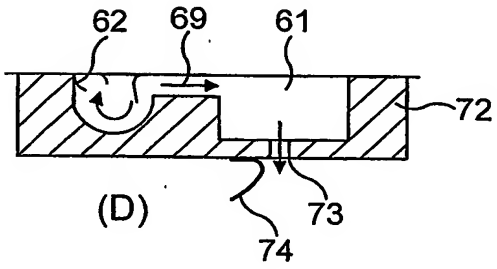
(A)



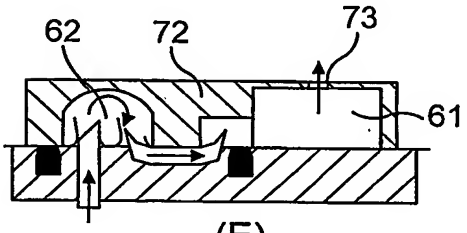
(B)



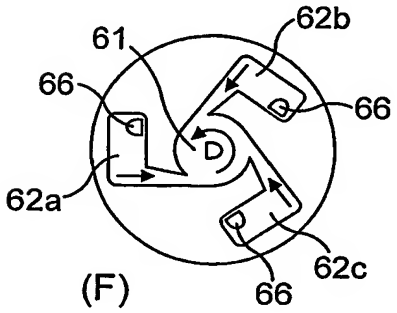
(C)



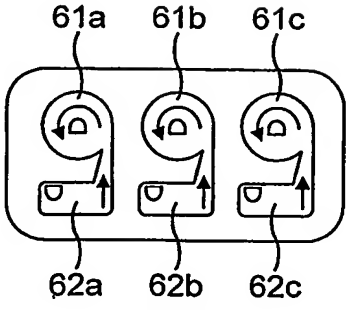
(D)



(E)



(F)



(G)

FIG. 11

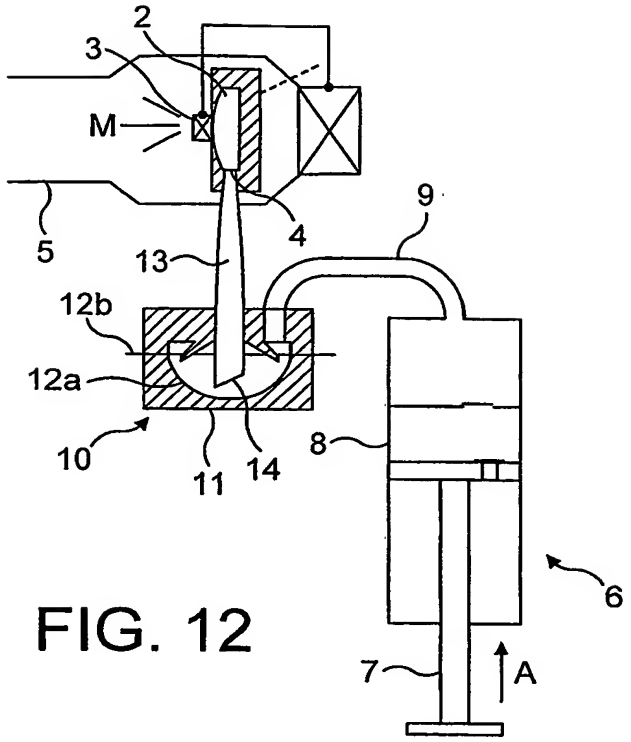


FIG. 12

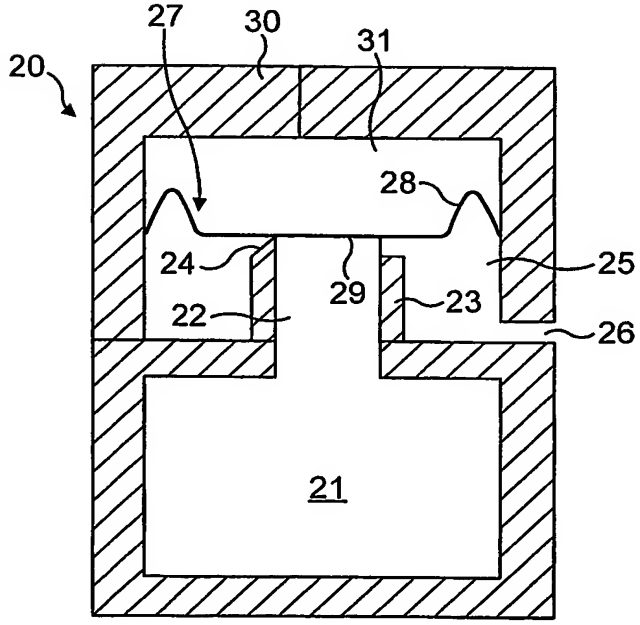


FIG. 13

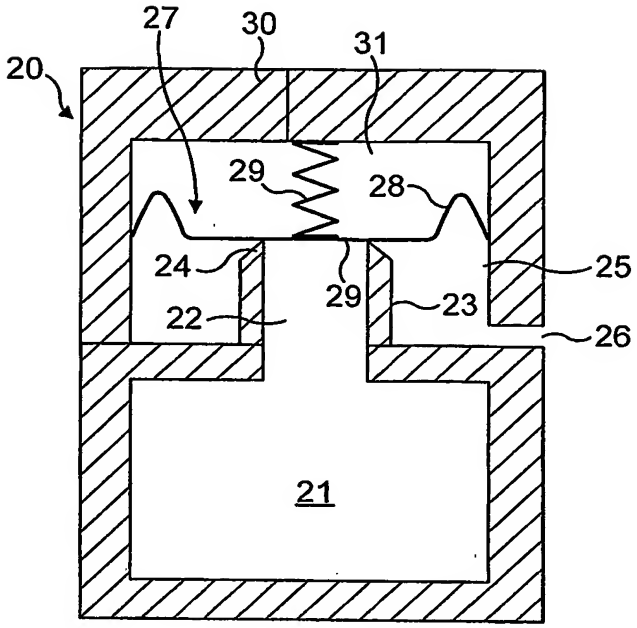

27
30
31
20
29
28
24
25
29
23
22
26
21

FIG. 14

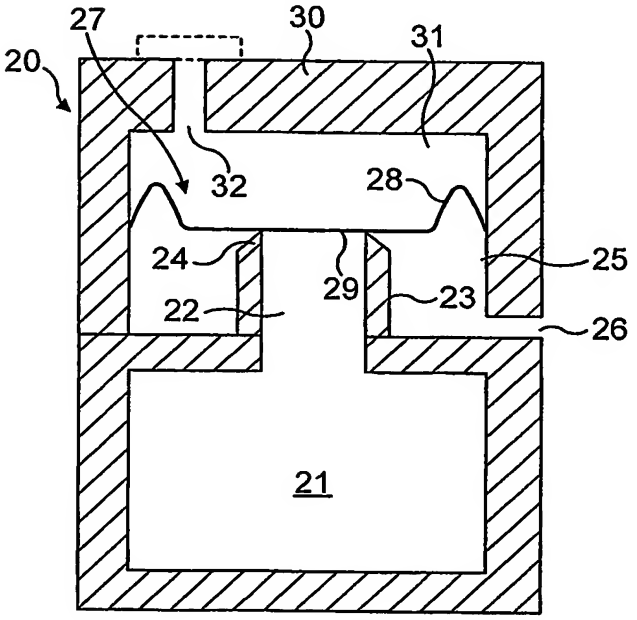

27
30
31
20
32
28
24
25
29
23
22
26
21

FIG. 15

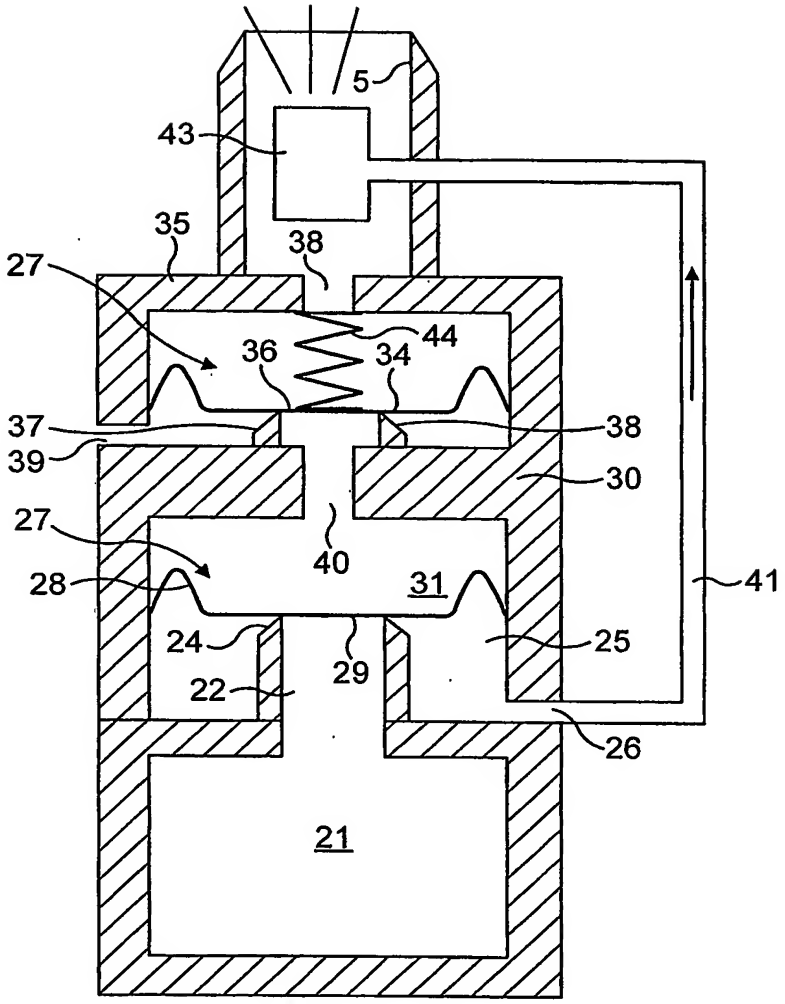


FIG. 16

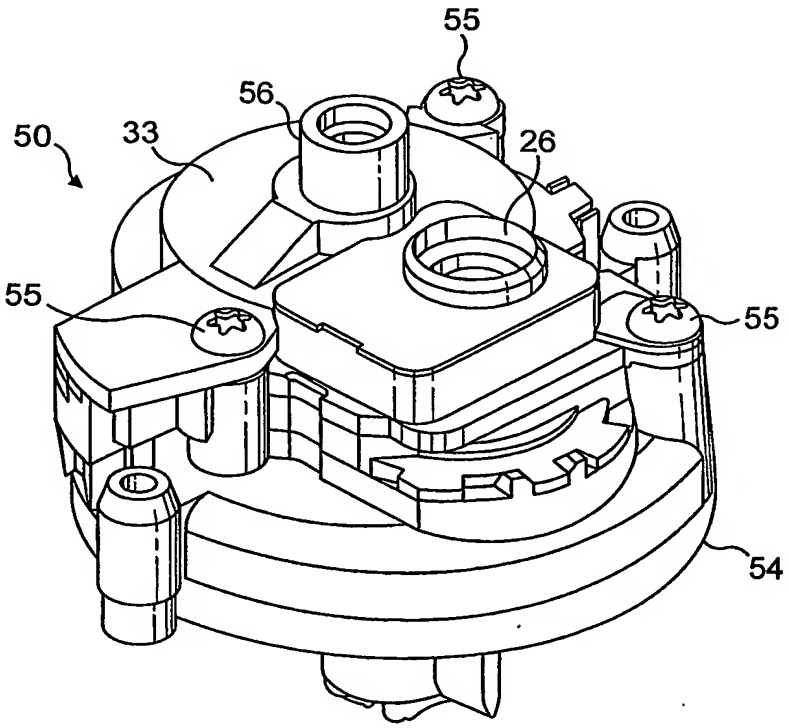


FIG. 17

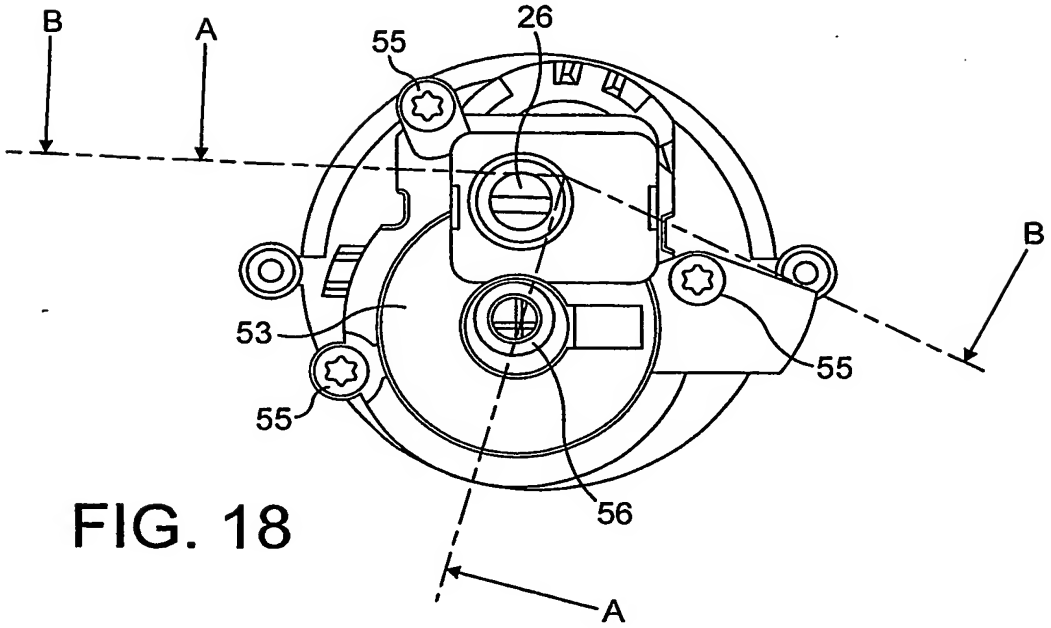


FIG. 18

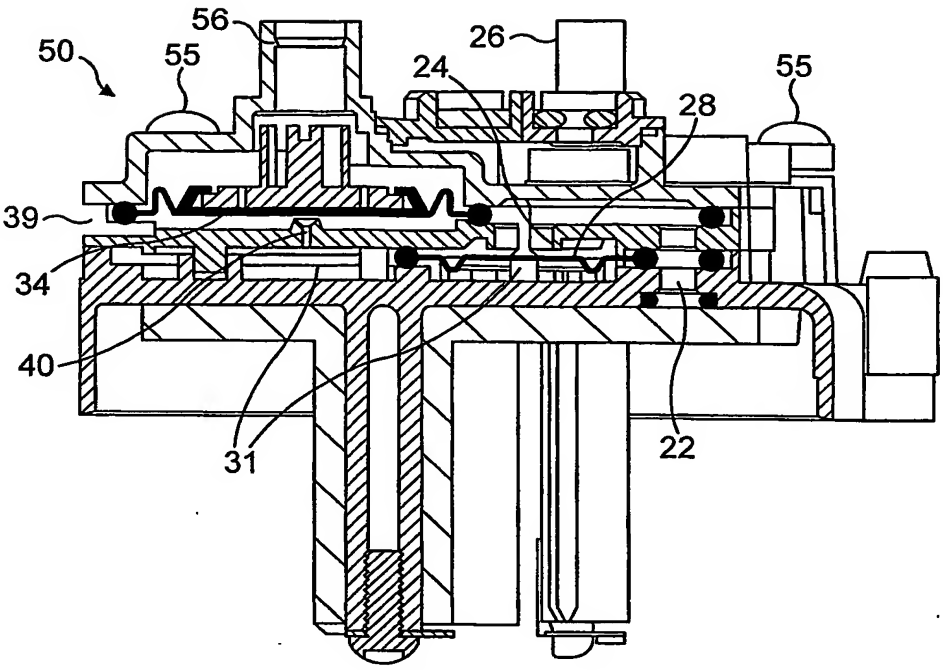


FIG. 19

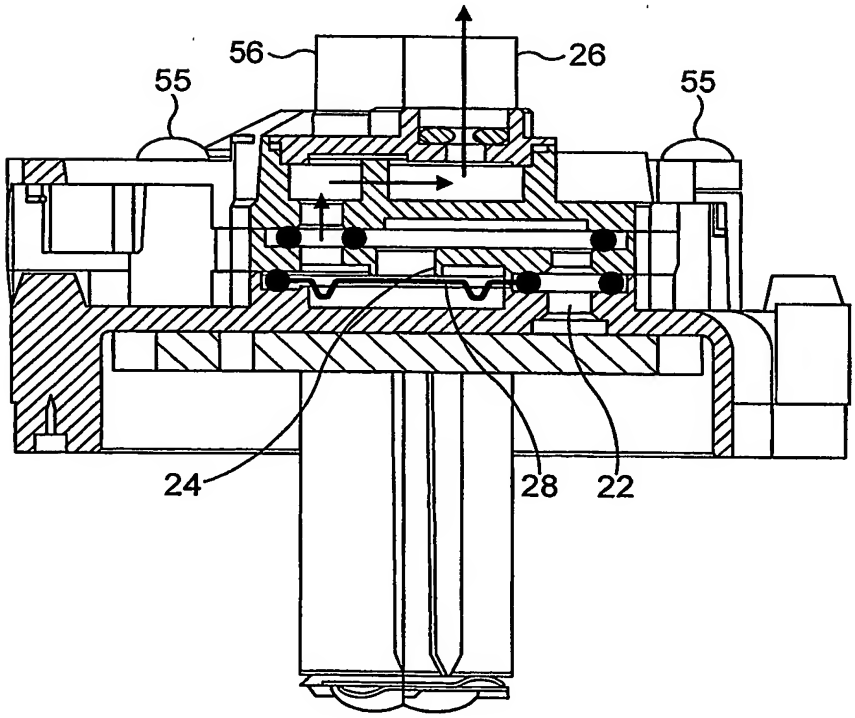


FIG. 20

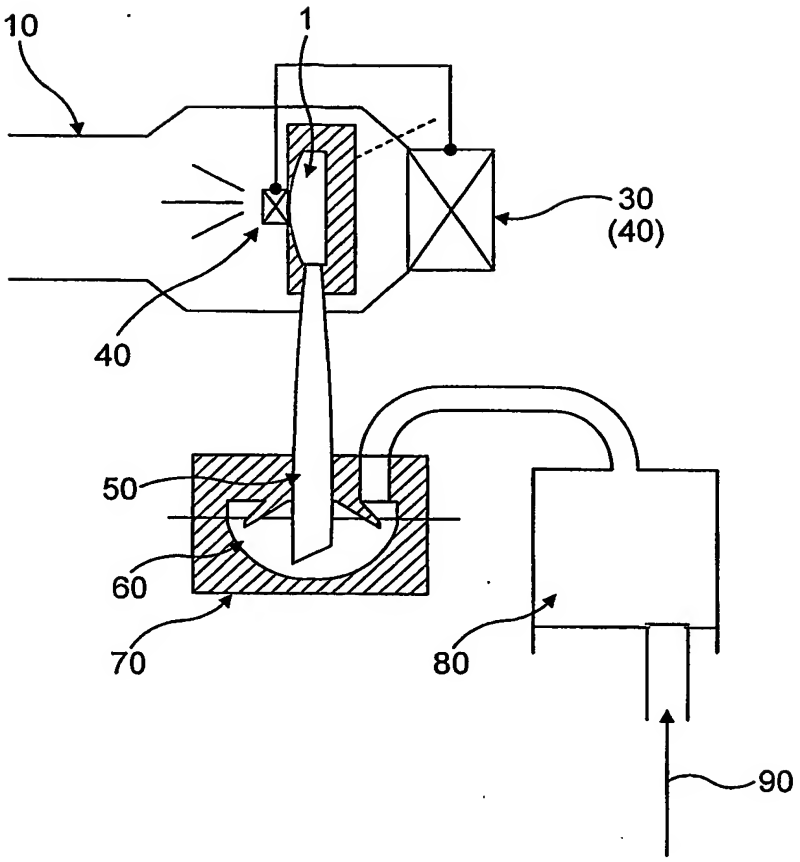


FIG. 21

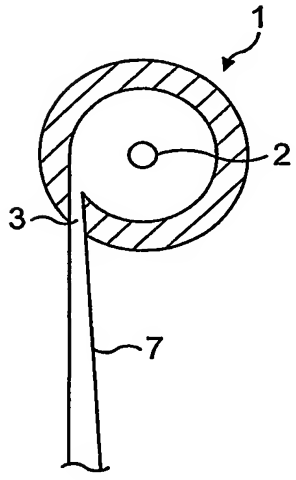


FIG. 22

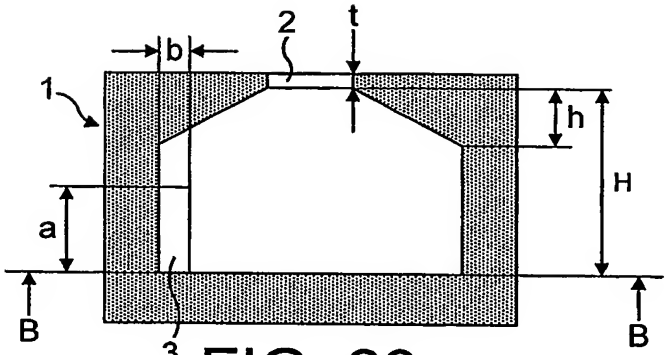


FIG. 23

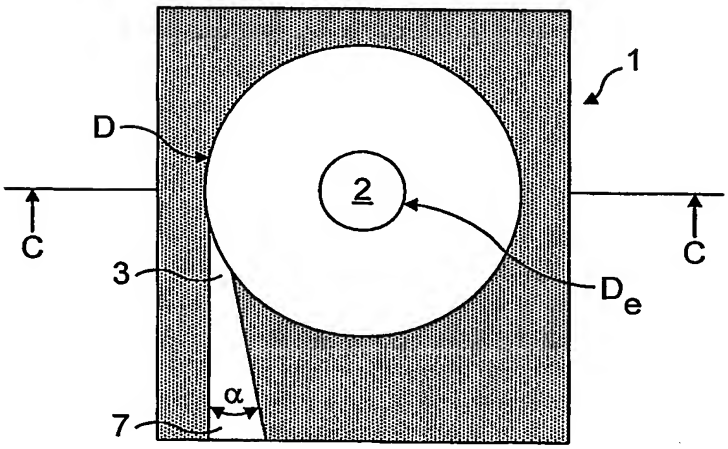


FIG. 24

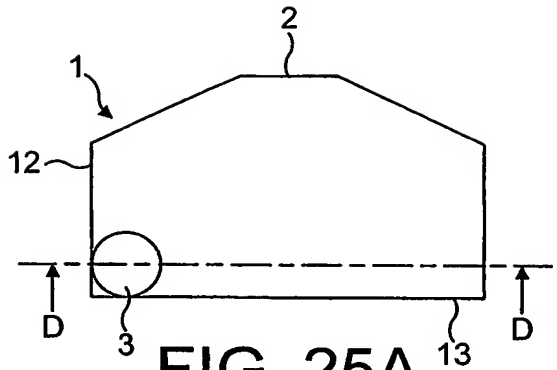


FIG. 25A

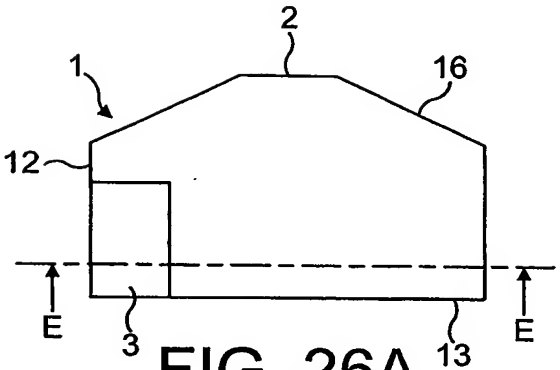


FIG. 26A

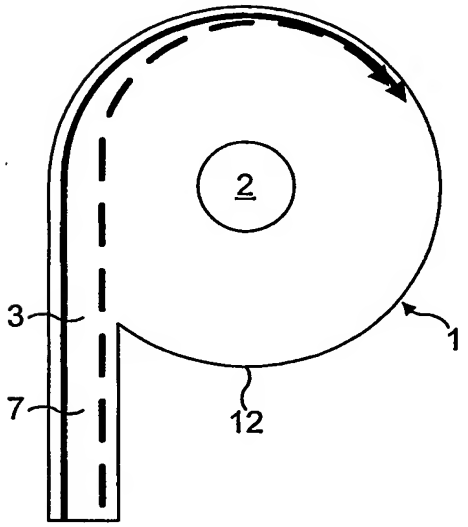


FIG. 25B

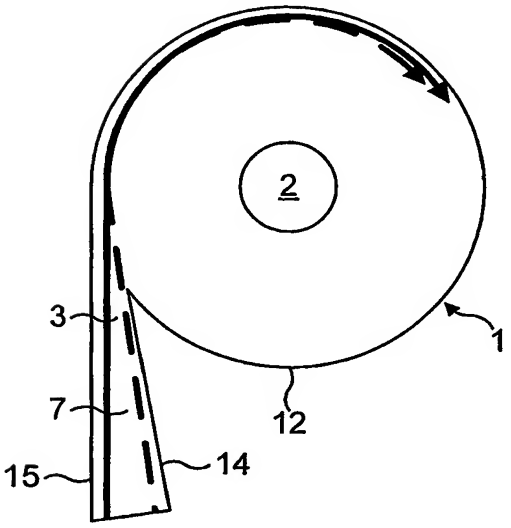


FIG. 26B

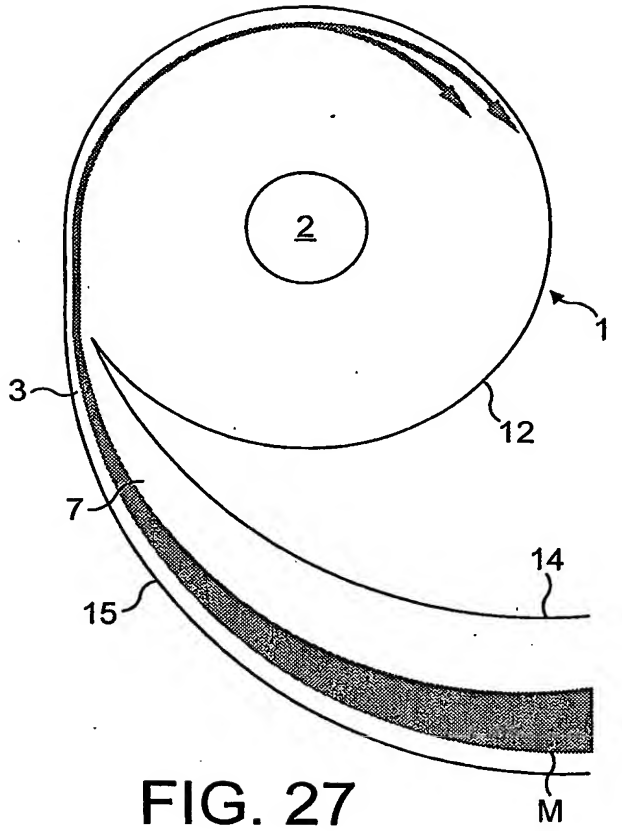


FIG. 27

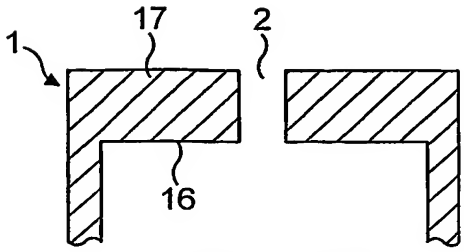


FIG. 28

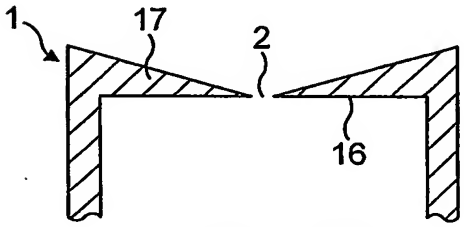


FIG. 29

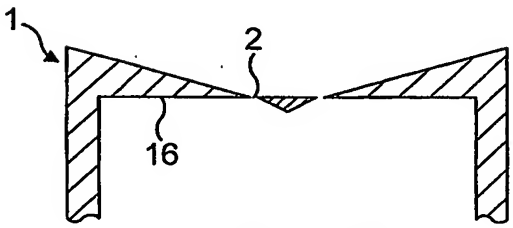


FIG. 30

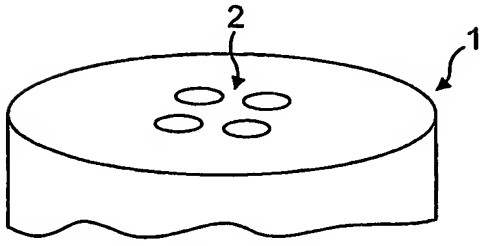


FIG. 31

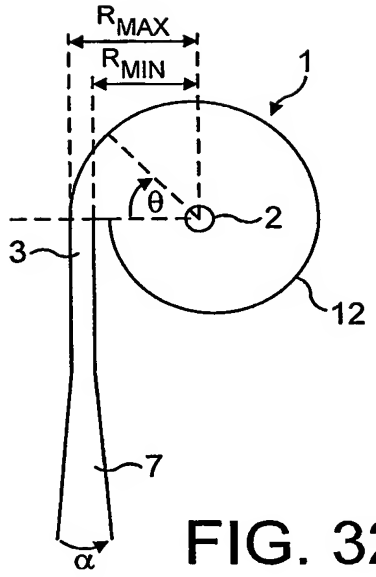


FIG. 32

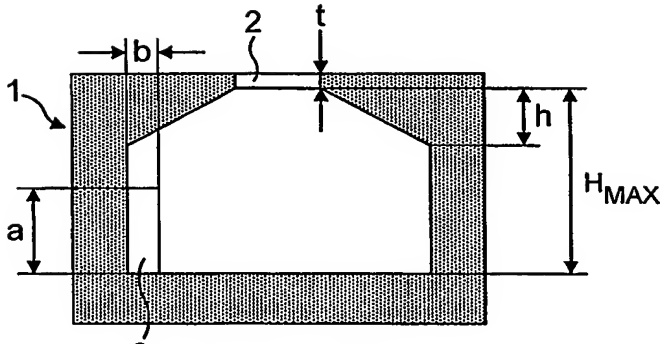


FIG. 33

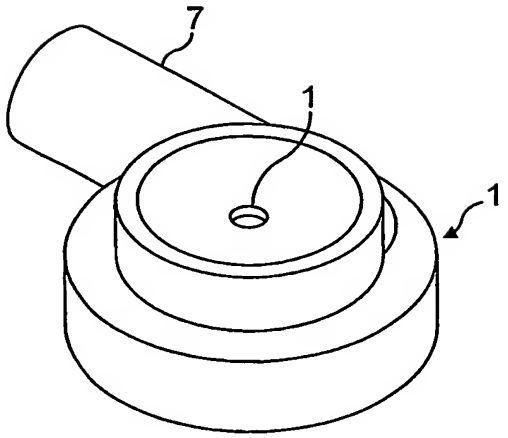


FIG. 34

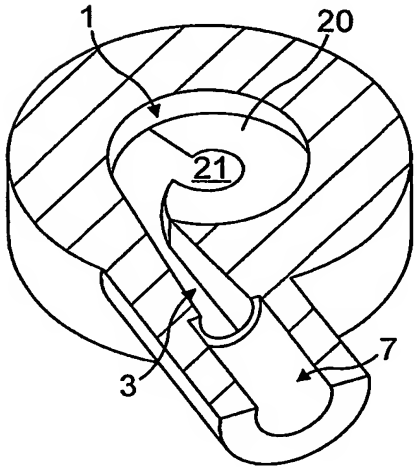


FIG. 35

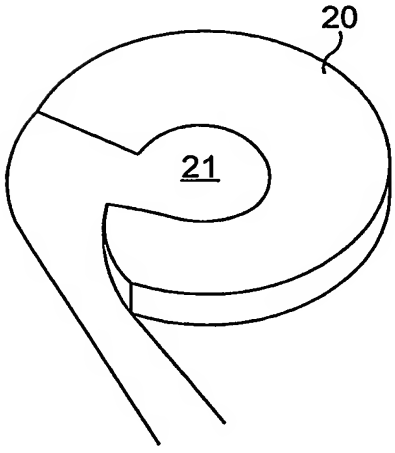


FIG. 36

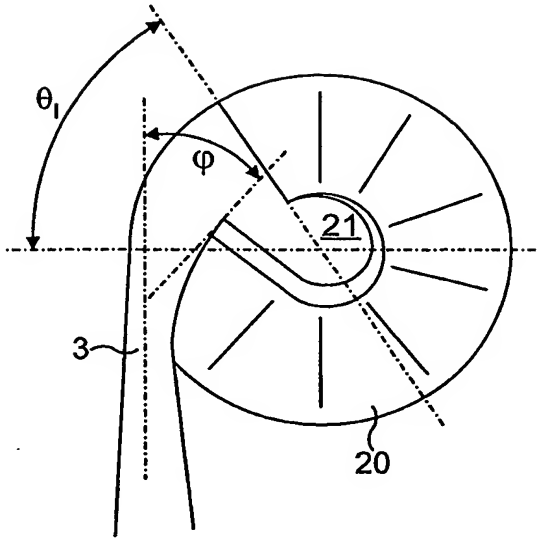


FIG. 37

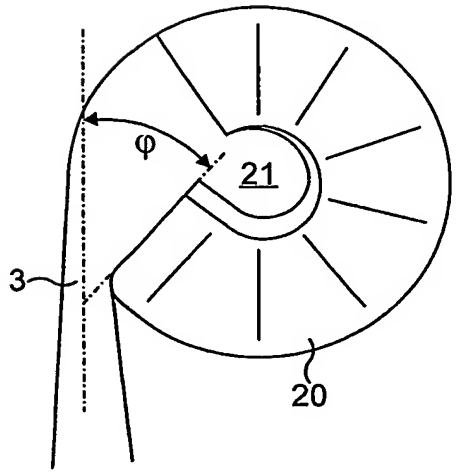


FIG. 38

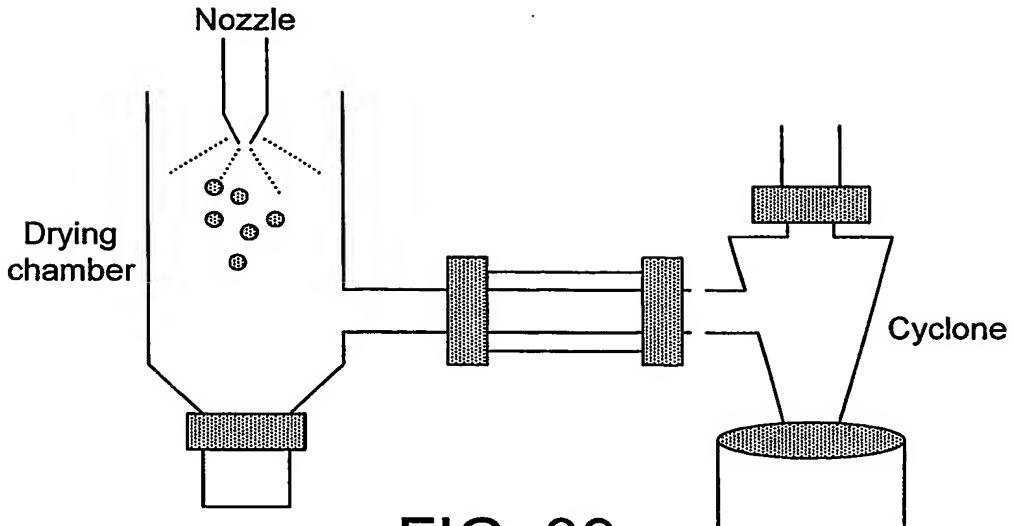


FIG. 39

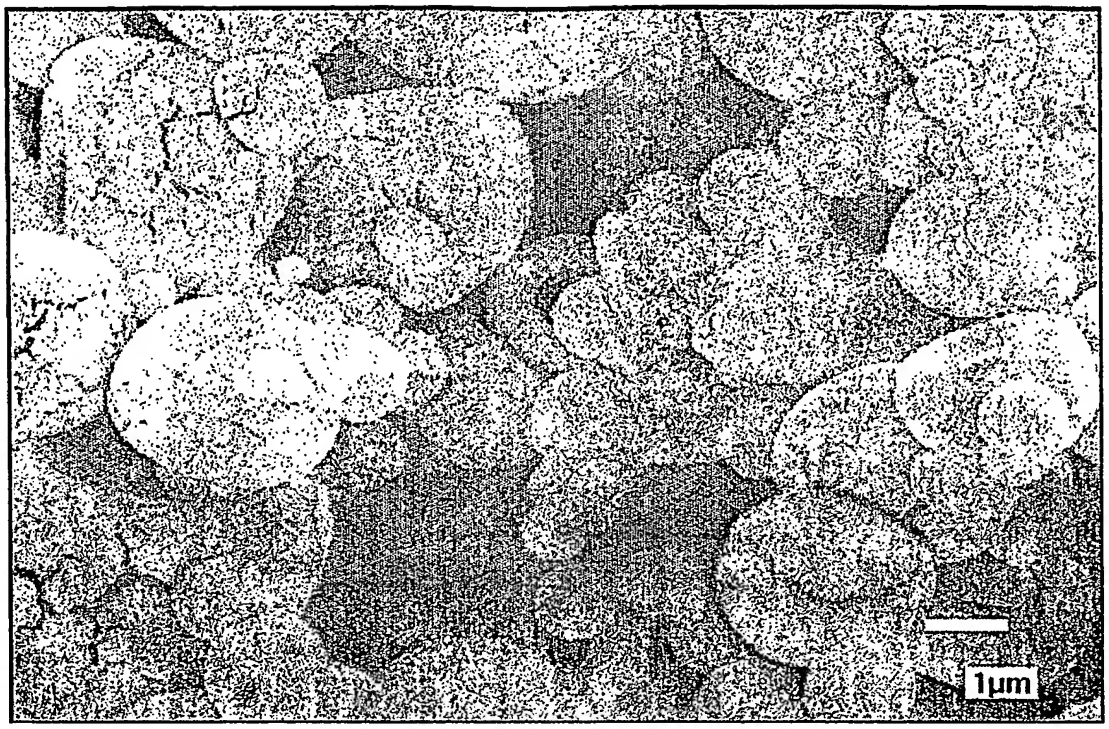


FIG. 40A

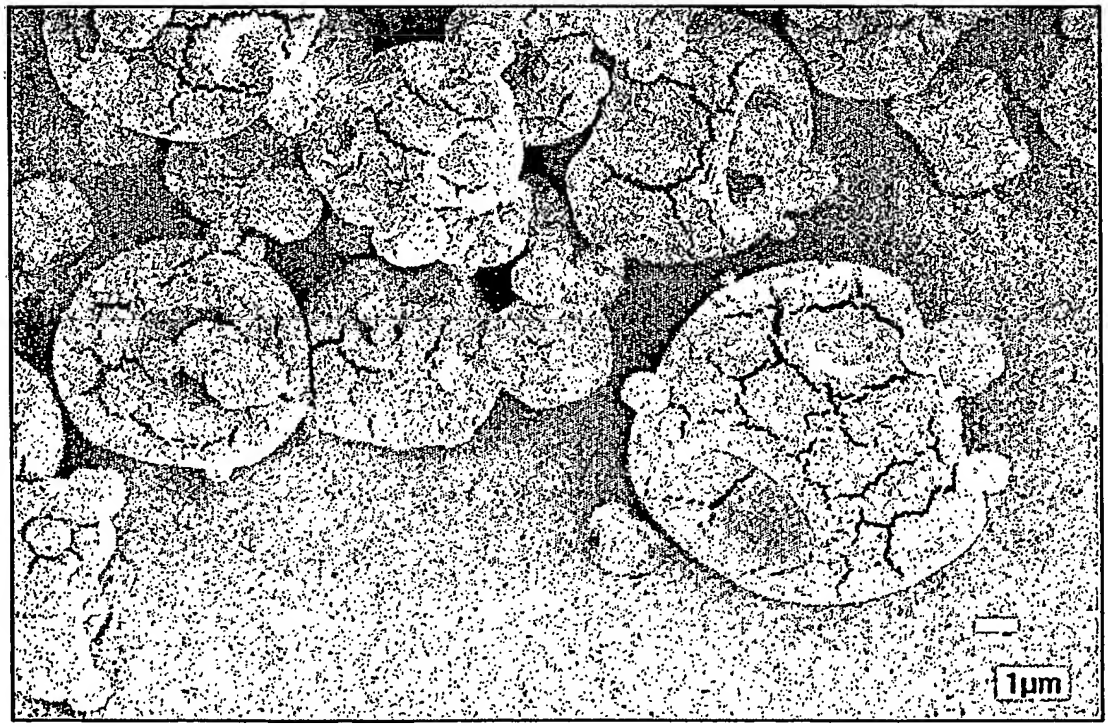


FIG. 40B

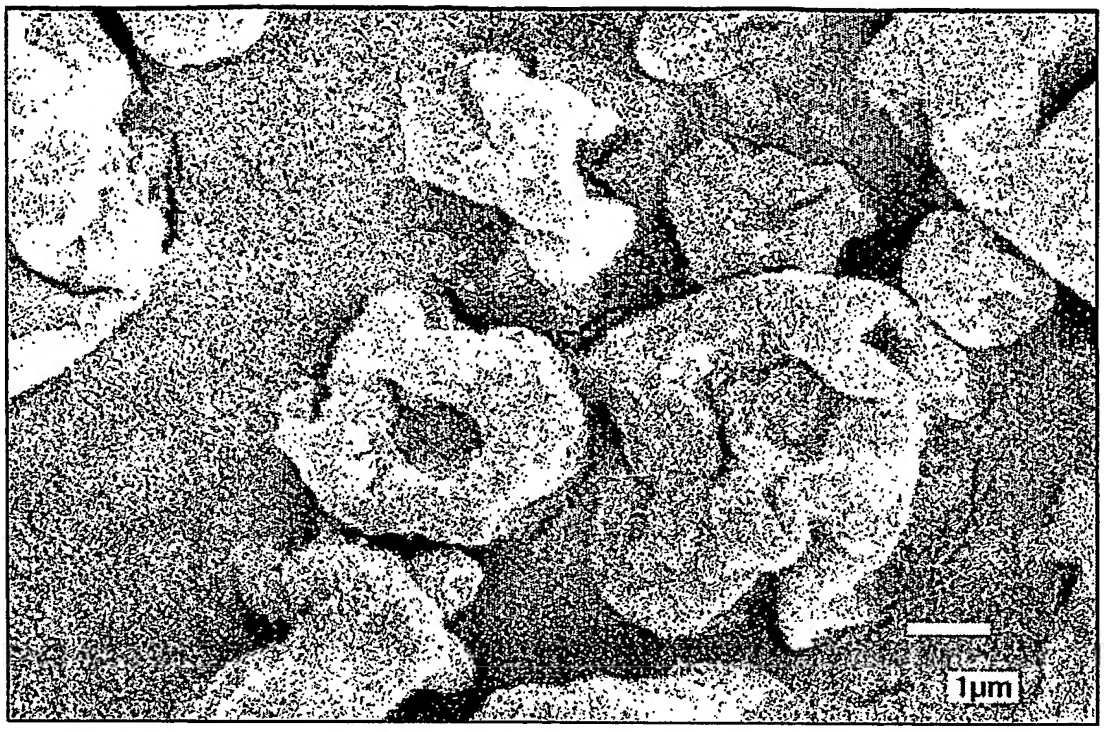


FIG. 40C

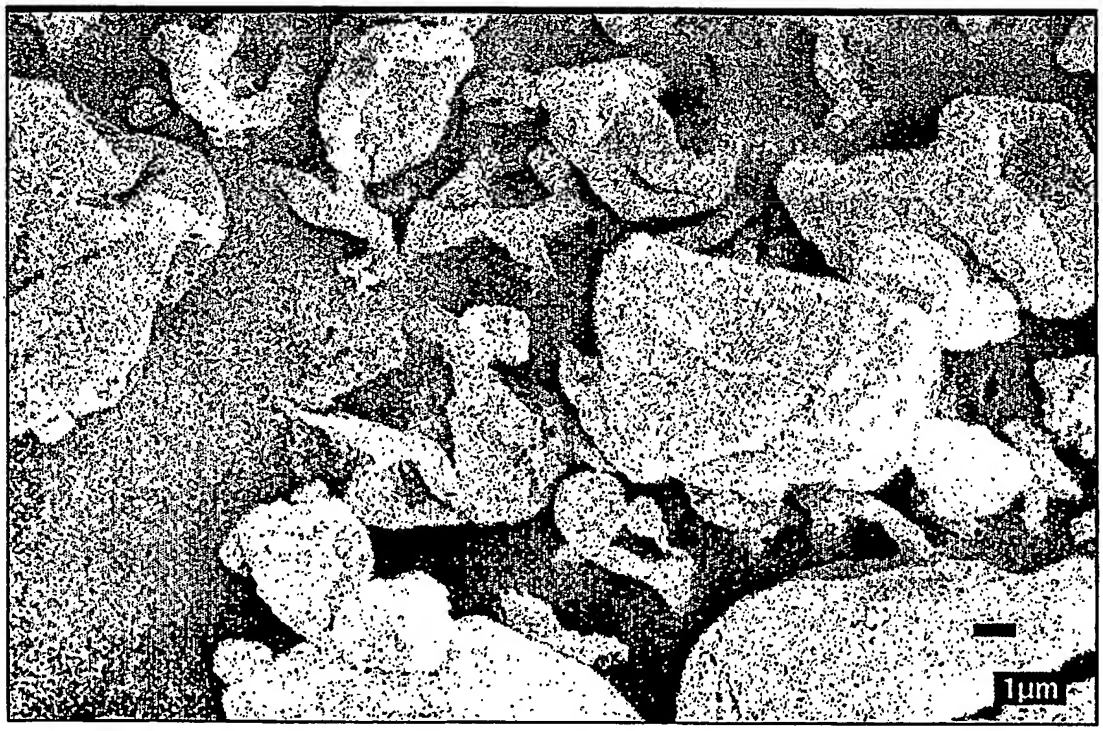


FIG. 40D

FIG. 40E

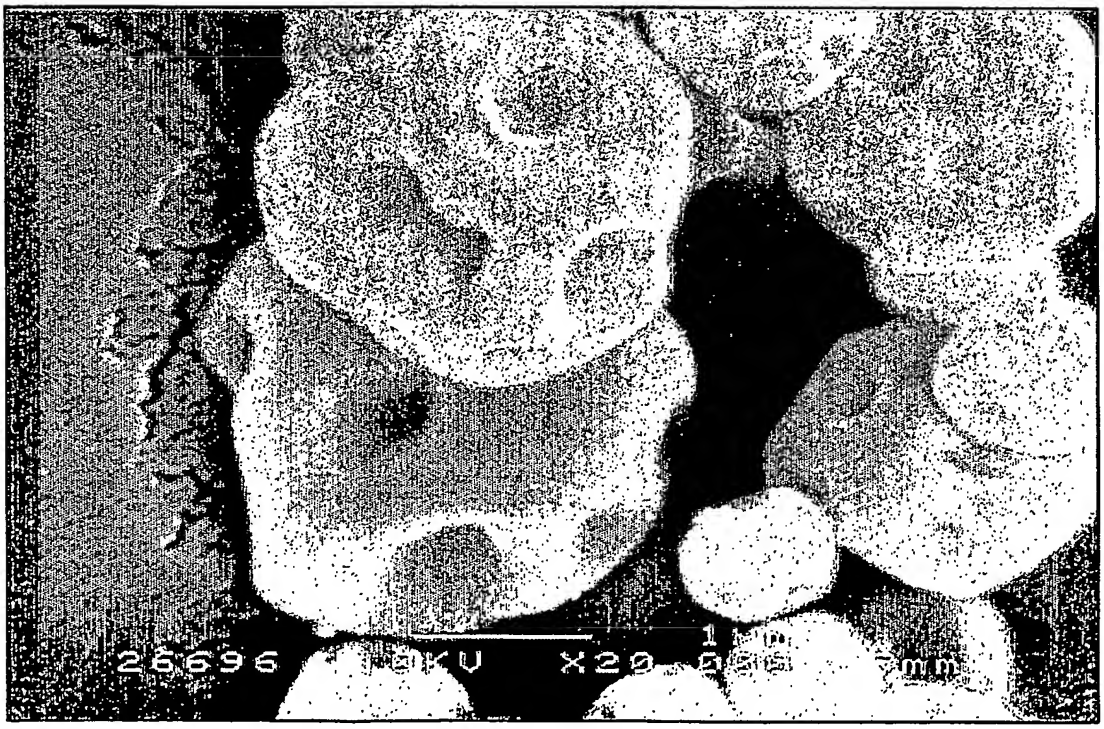


FIG. 40F

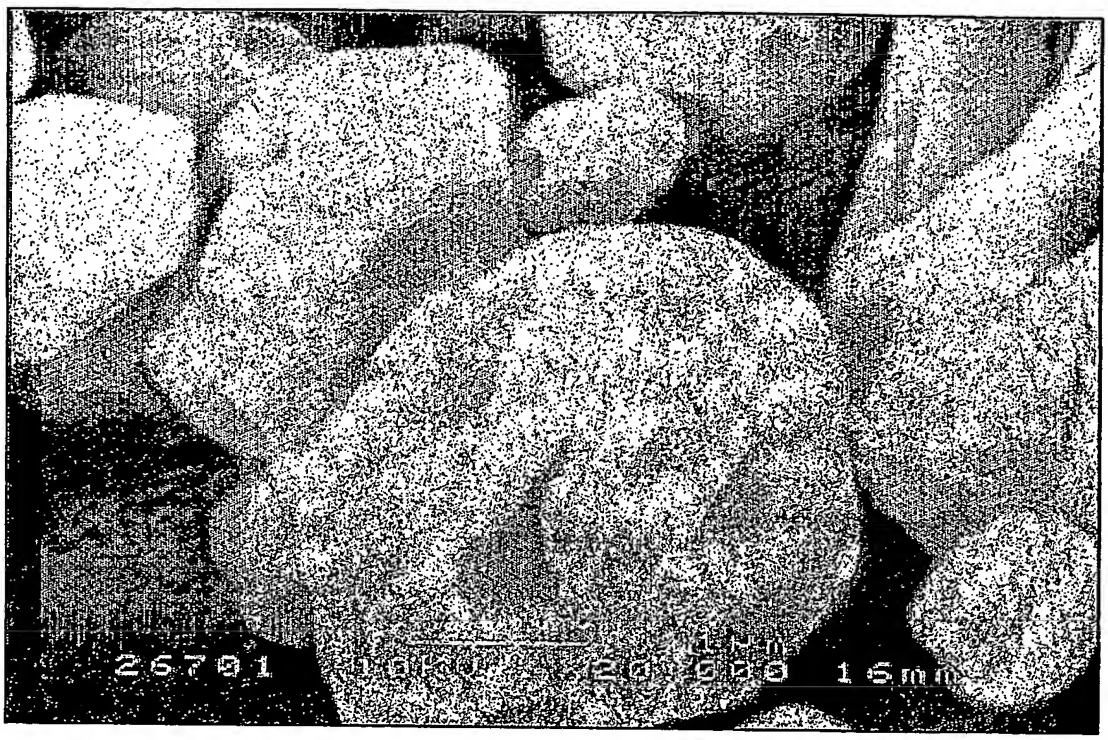


FIG. 40G

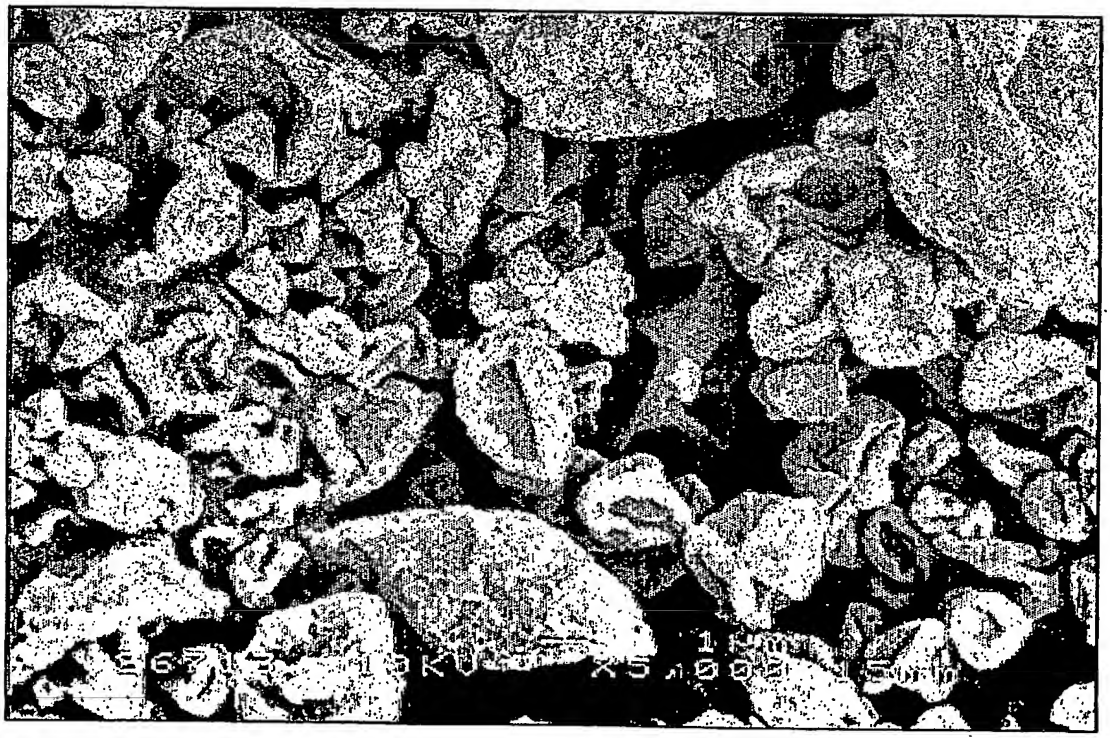


FIG. 40H

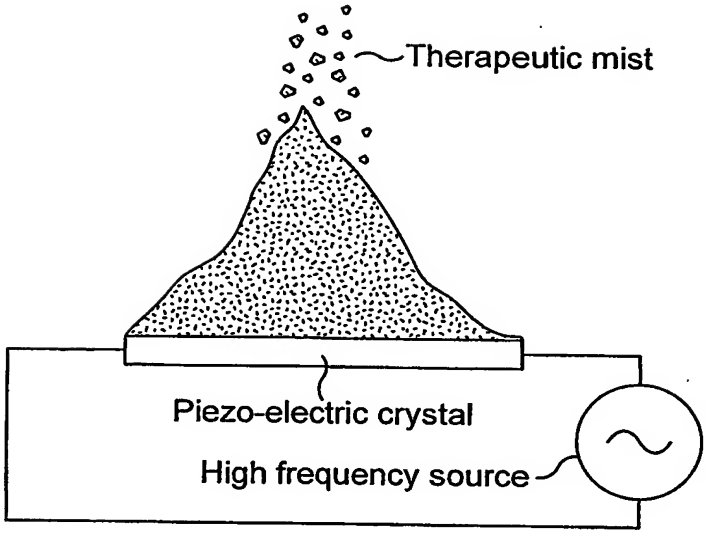

Therapeutic mist
Piezo-electric crystal
High frequency source

FIG. 41

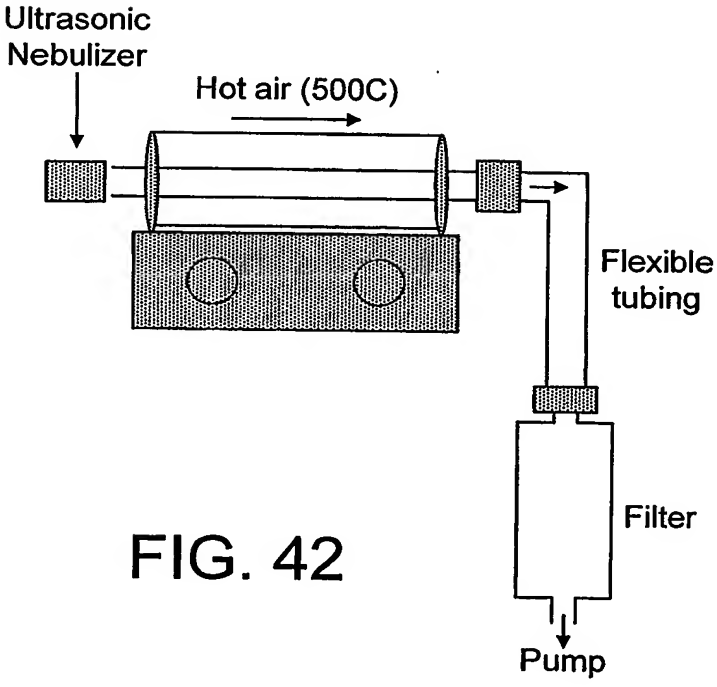

Ultrasonic Nebulizer
Hot air (500C)
Flexible tubing
Filter
Pump

FIG. 42

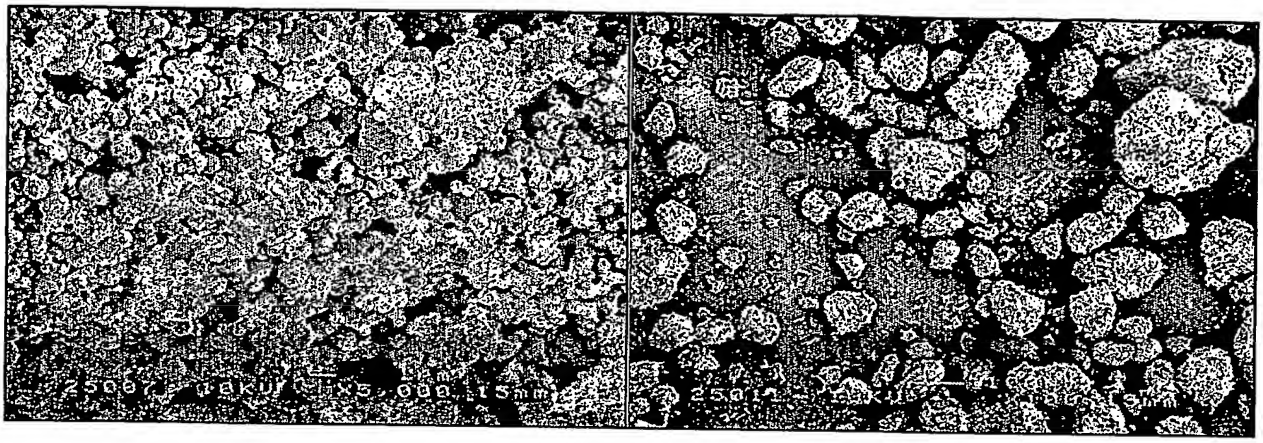


FIG. 43A

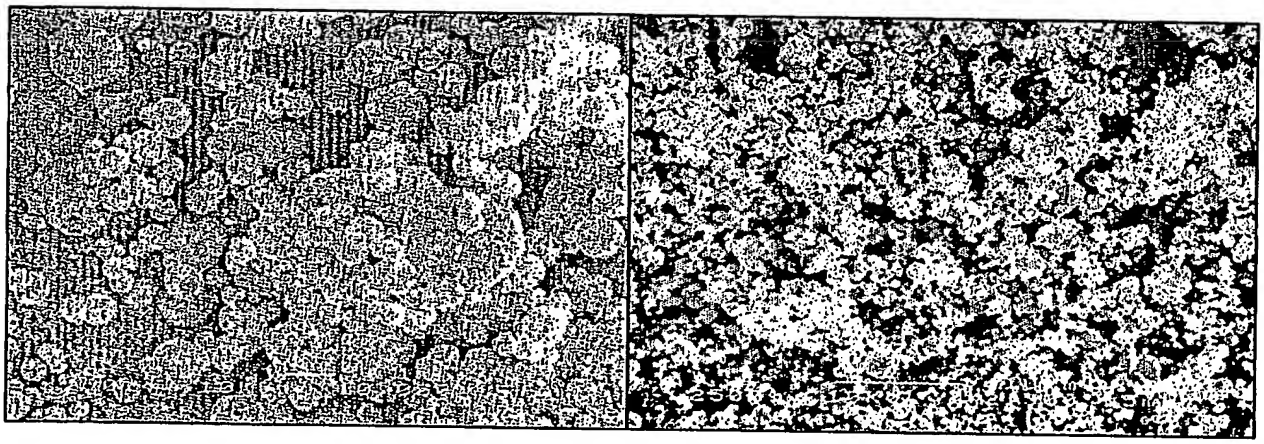


FIG. 43B

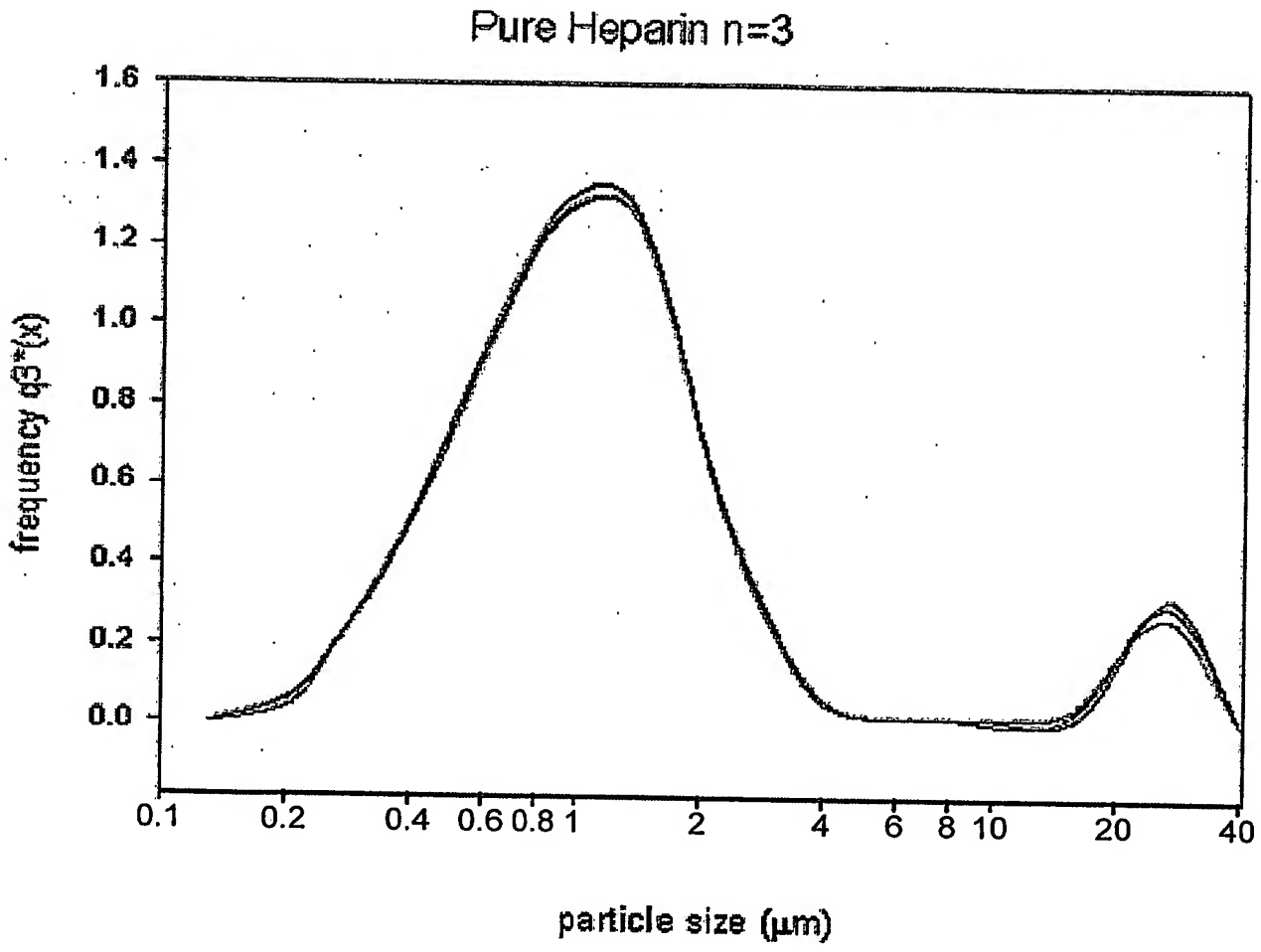

Pure Heparin n=3
frequency q3*(x)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.1
0.2
0.4
0.6
0.8
1
2
4
6
8
10
20
40
particle size (µm)

FIG. 44

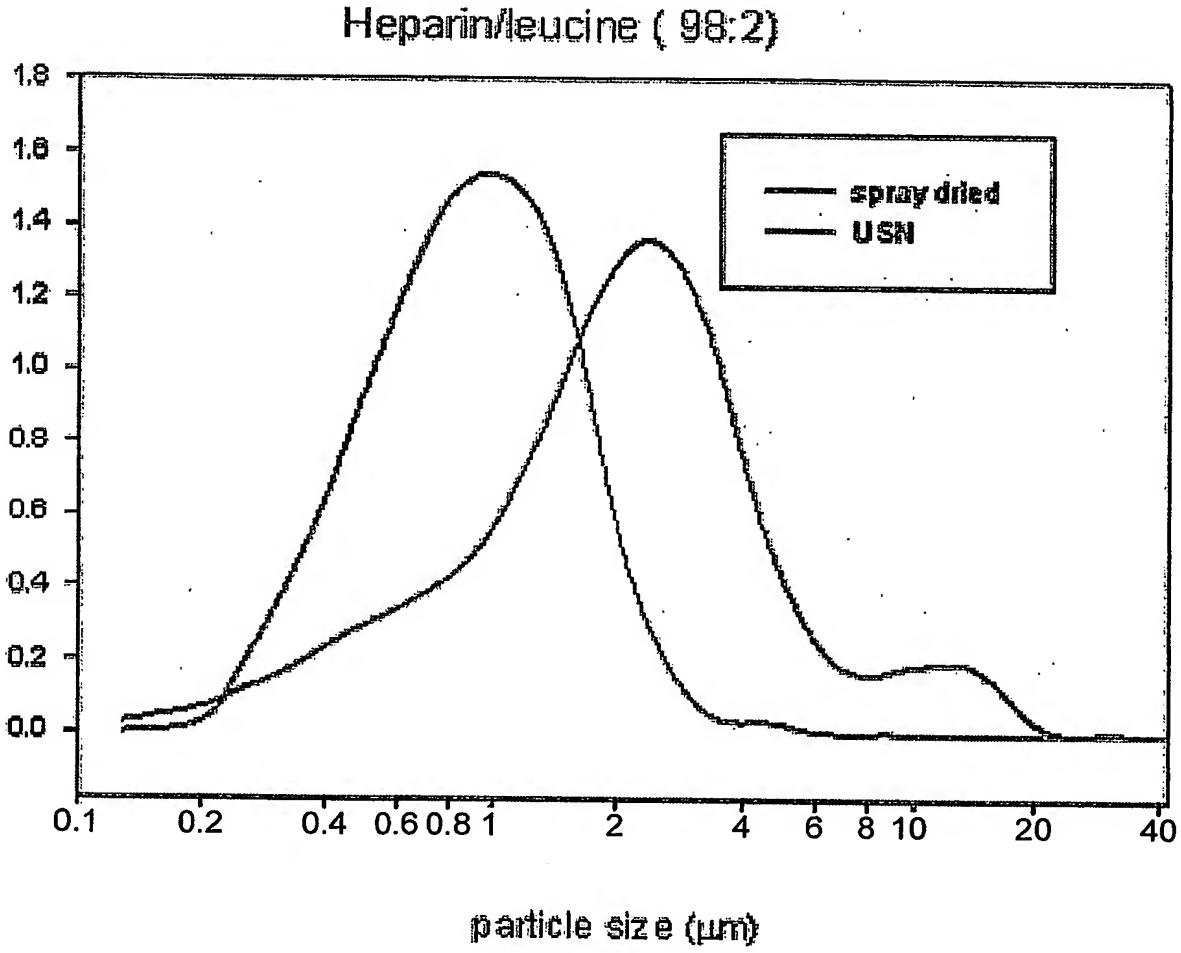

Heparin/leucine (98:2)
spray dried
USN
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.1
0.2
0.4
0.6
0.8
1
2
4
6
8
10
20
40
particle size (µm)

FIG. 45A

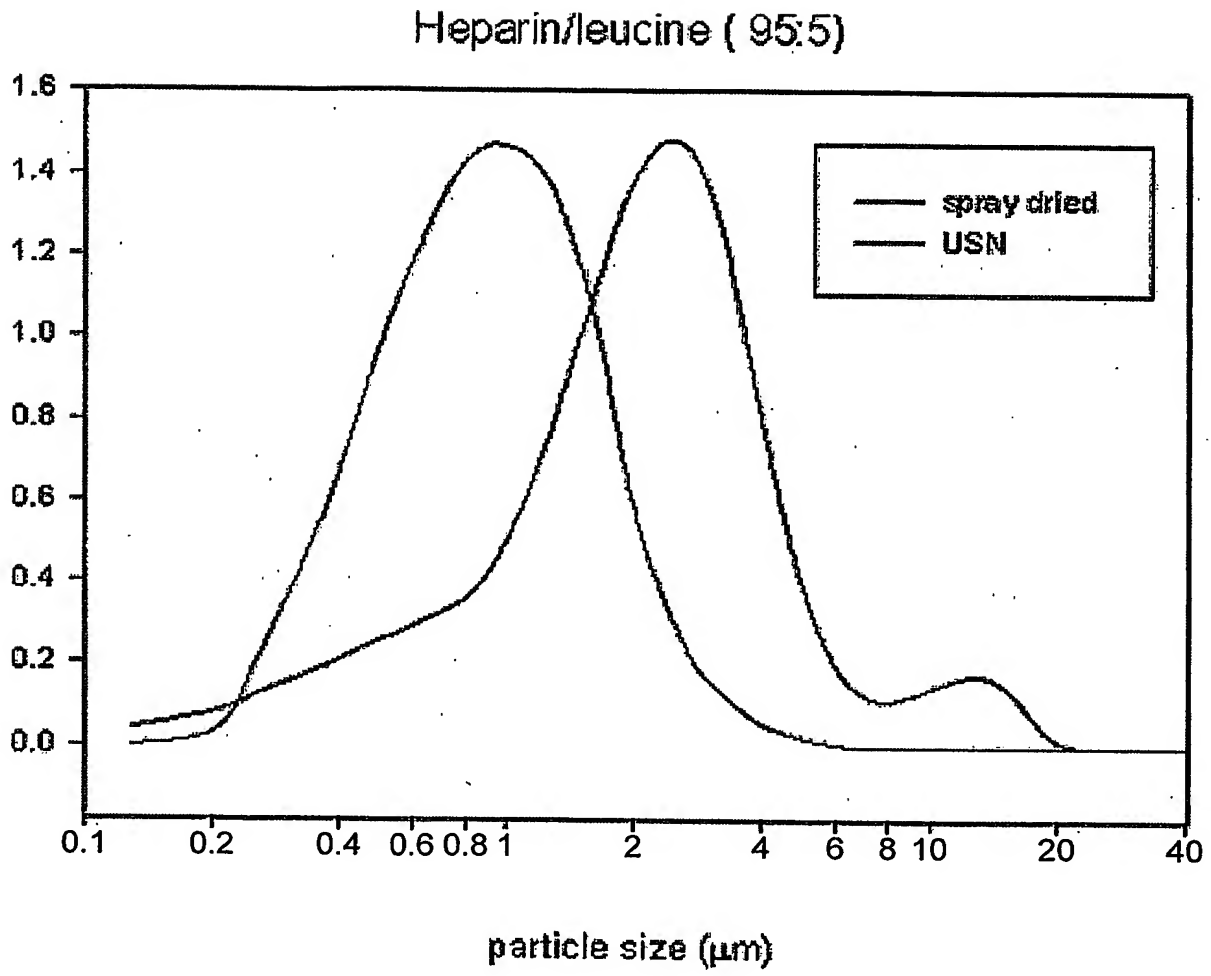

Heparin/leucine (95:5)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
spray dried
USN
0.1
0.2
0.4
0.6
0.8
1
2
4
6
8
10
20
40
particle size (µm)

FIG. 45B

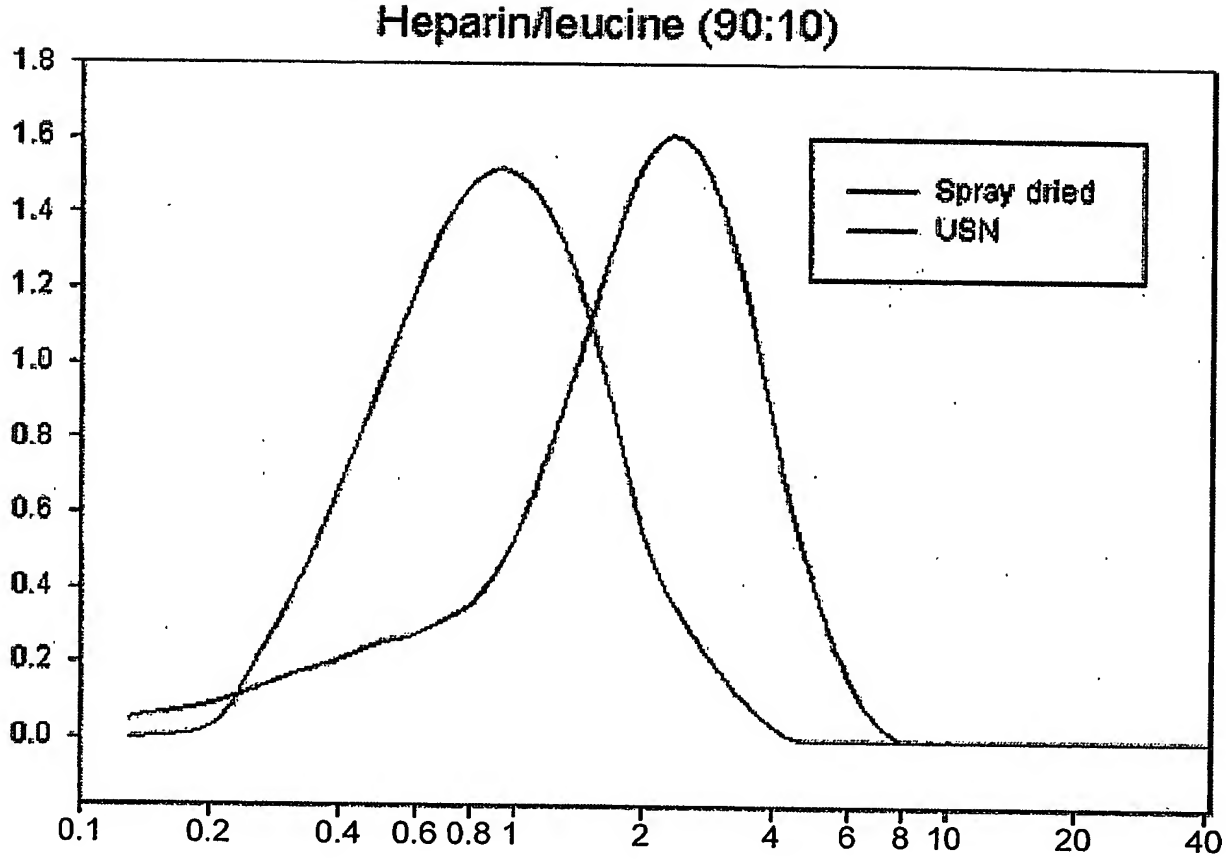

Heparin/leucine (90:10)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Spray dried
USN
0.1
0.2
0.4
0.6
0.8
1
2
4
6
8
10
20
40
particle size (μm)

FIG. 45C

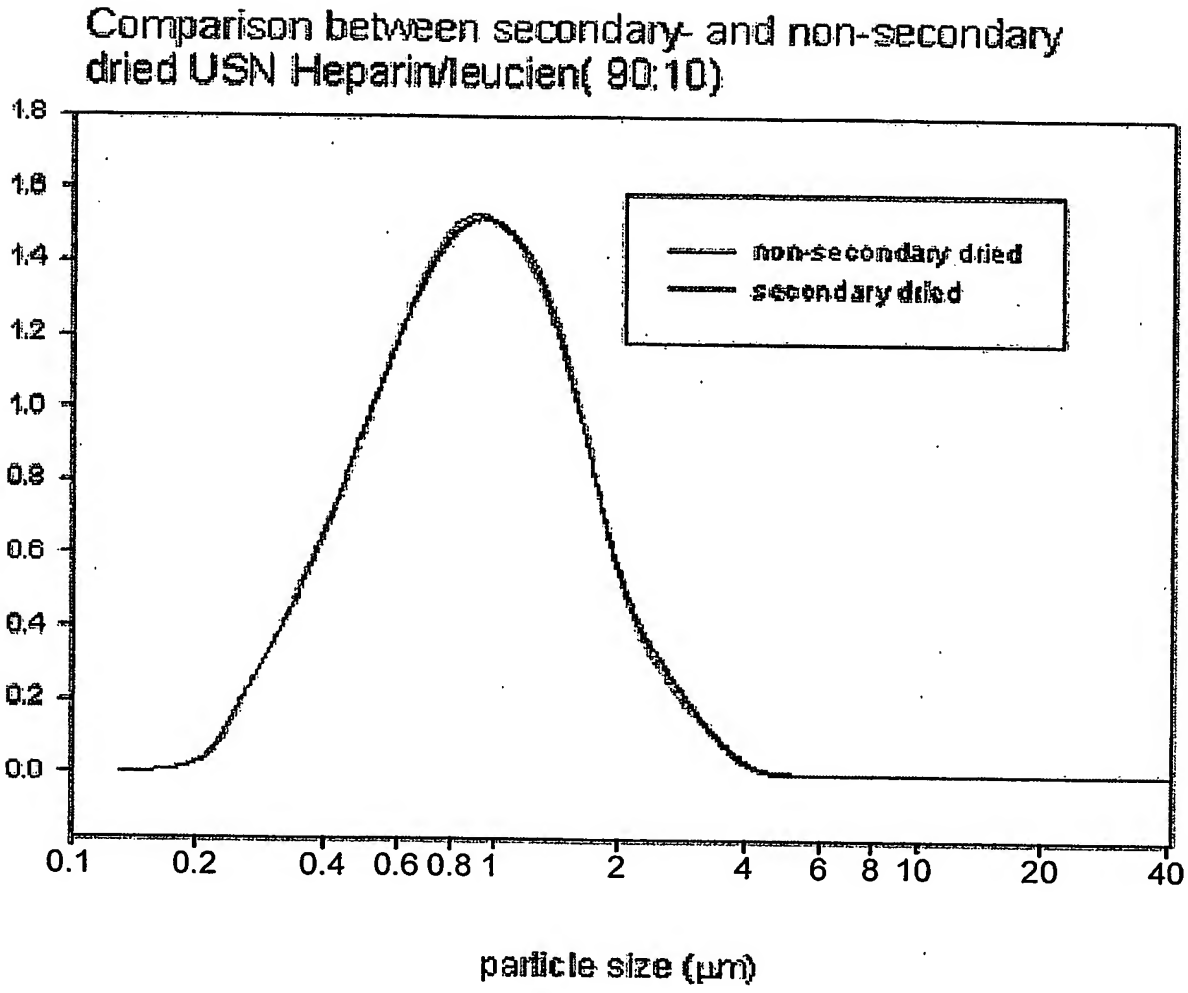

Comparison between secondary- and non-secondary dried USN Heparin/leucien(90:10)
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
non-secondary dried
secondary dried
0.1
0.2
0.4
0.6
0.8
1
2
4
6
8
10
20
40
particle size (µm)

FIG. 46

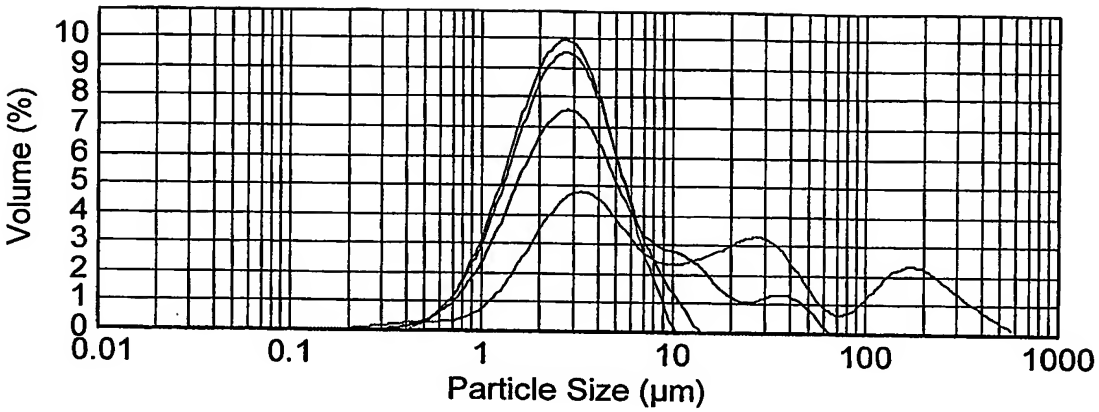


FIG. 47A

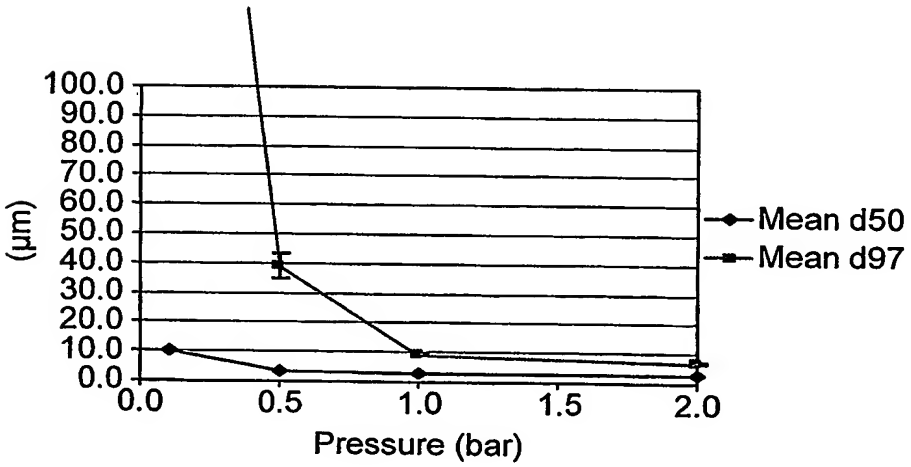


FIG. 47B

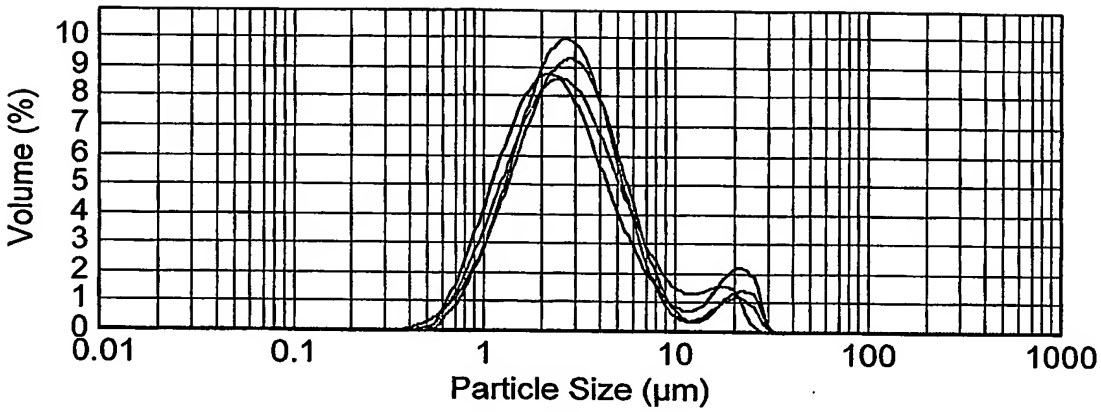


FIG. 48A

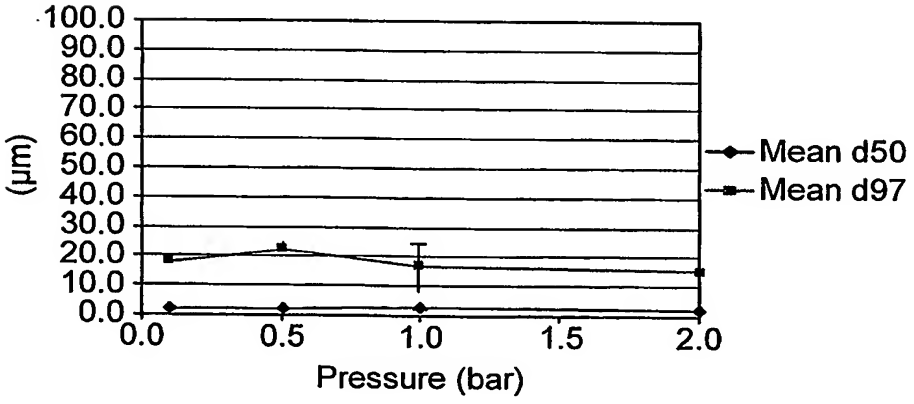


FIG. 48B

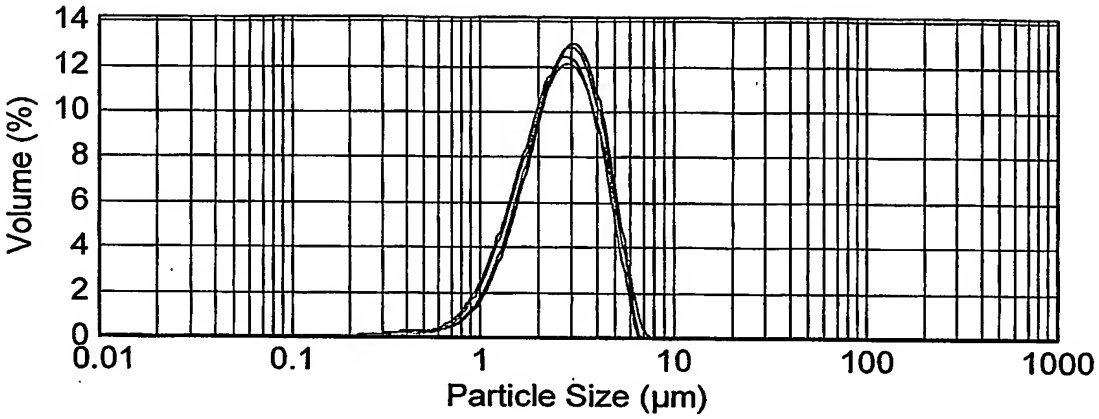


FIG. 49A

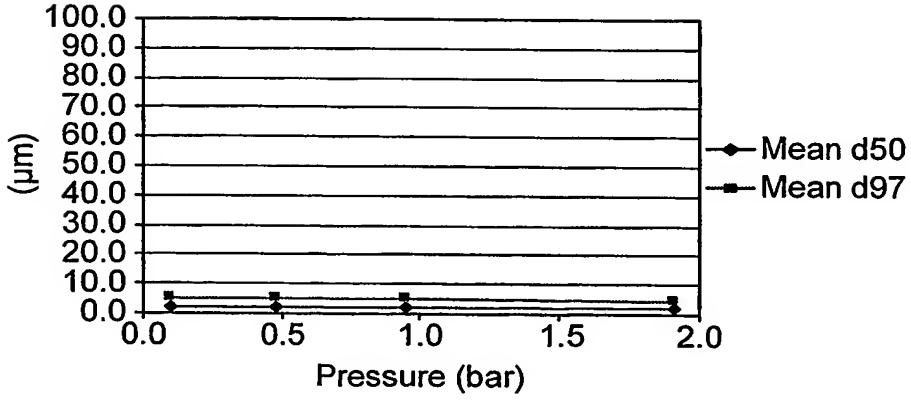


FIG. 49B

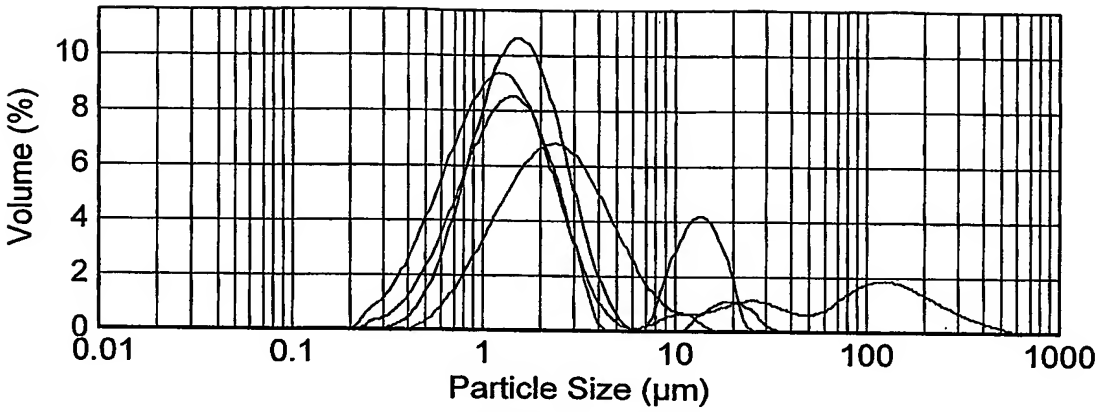


FIG. 50A

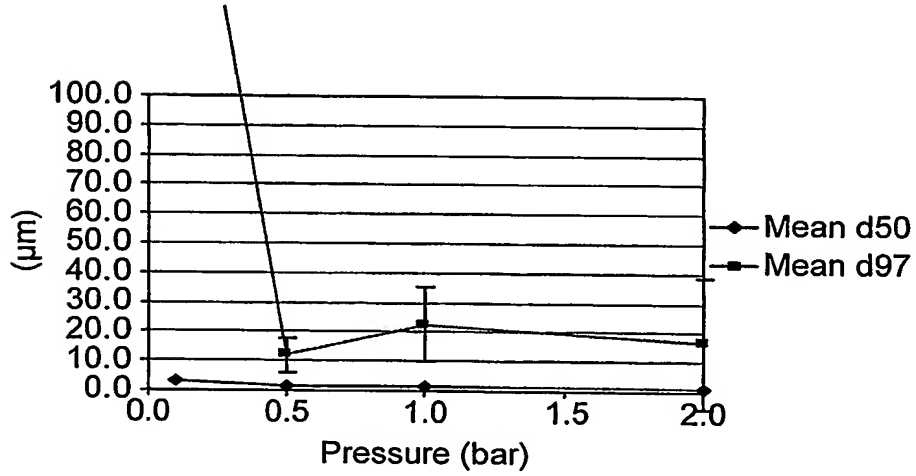


FIG. 50B

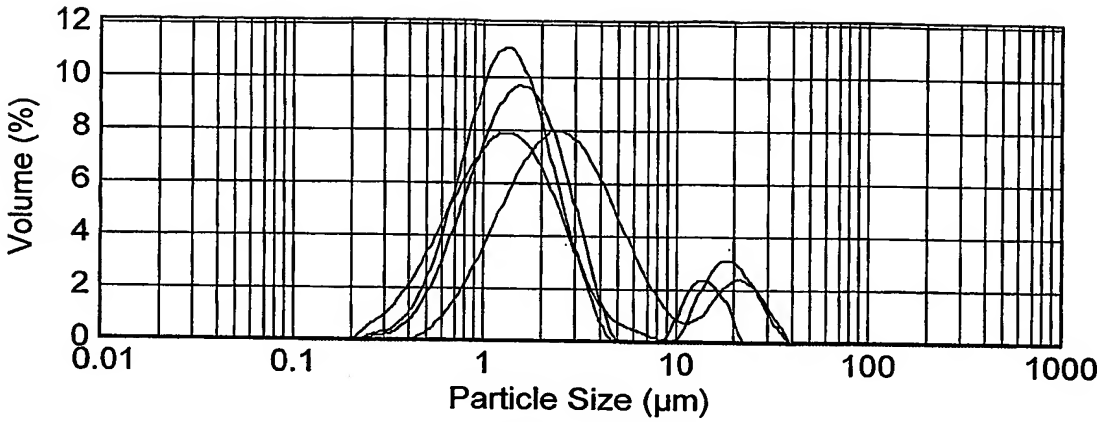


FIG. 51A

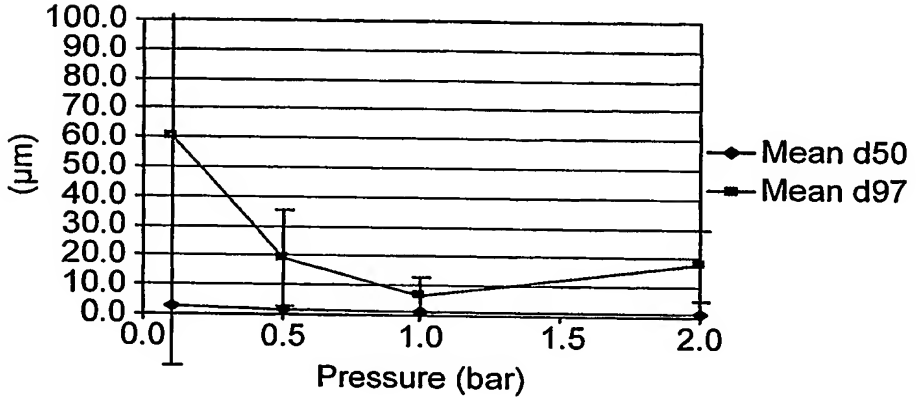


FIG. 51B

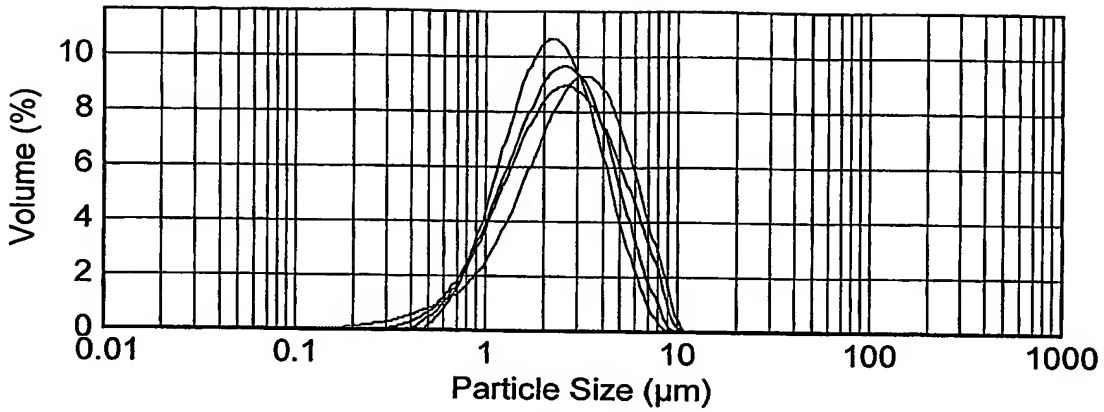


FIG. 52A

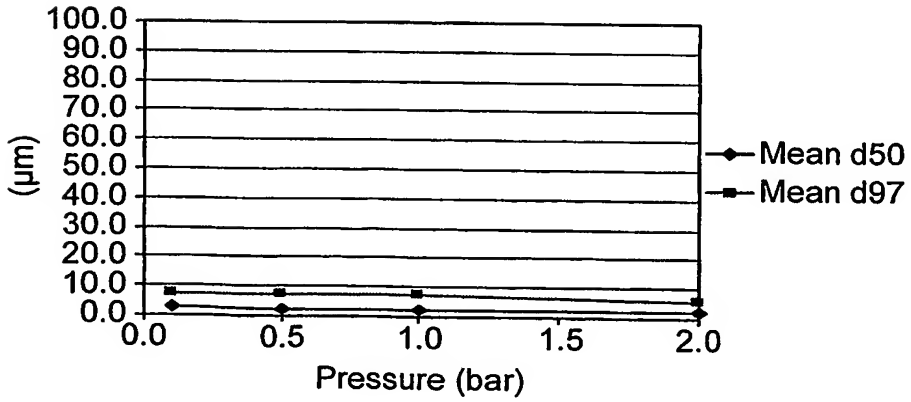


FIG. 52B

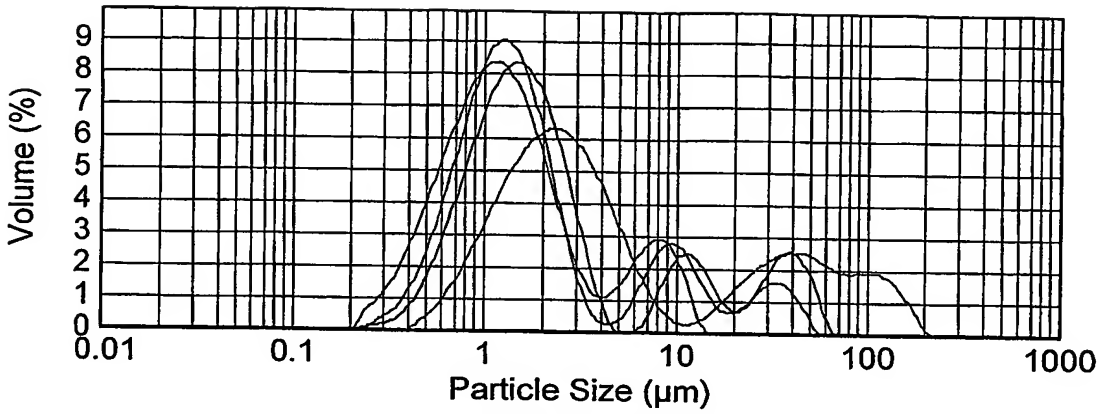


FIG. 53A

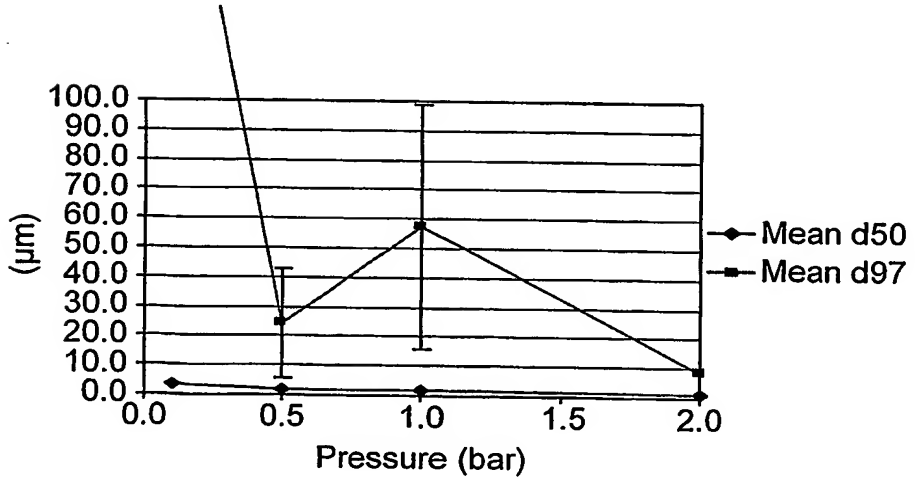


FIG. 53B

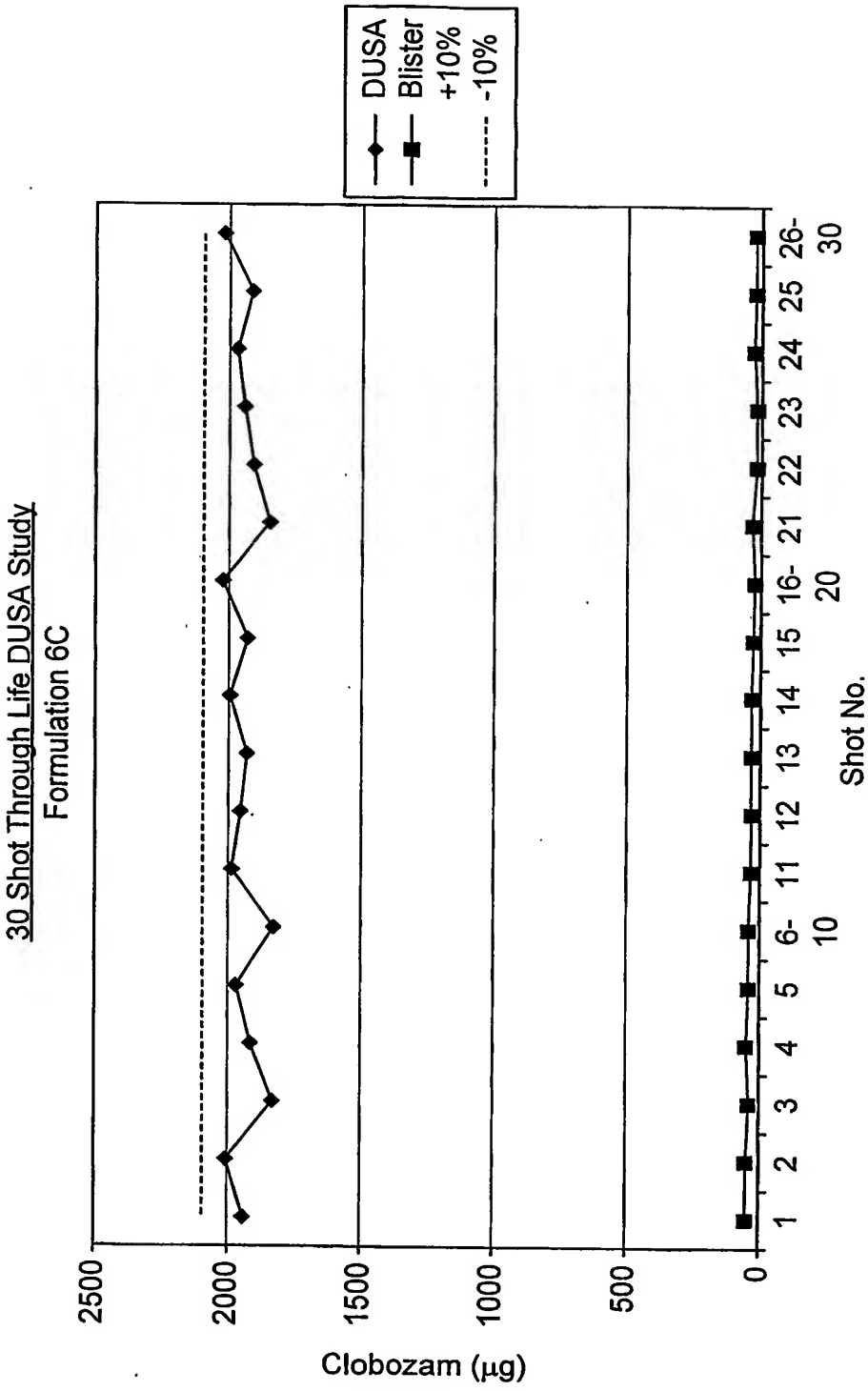

30 Shot Through Life DUSA Study
Formulation 6C
DUSA
Blister
+10%
-10%
Clobozam (µg)
2500
2000
1500
1000
500
0
1
2
3
4
5
6-
10
11
12
13
14
15
16-
20
21
22
23
24
25
26-
30
Shot No.
(CL I,60 l/min, 1.5 bar, 15ml resevoir, 2mg blister, 1900ug Clobozam)

FIG. 54

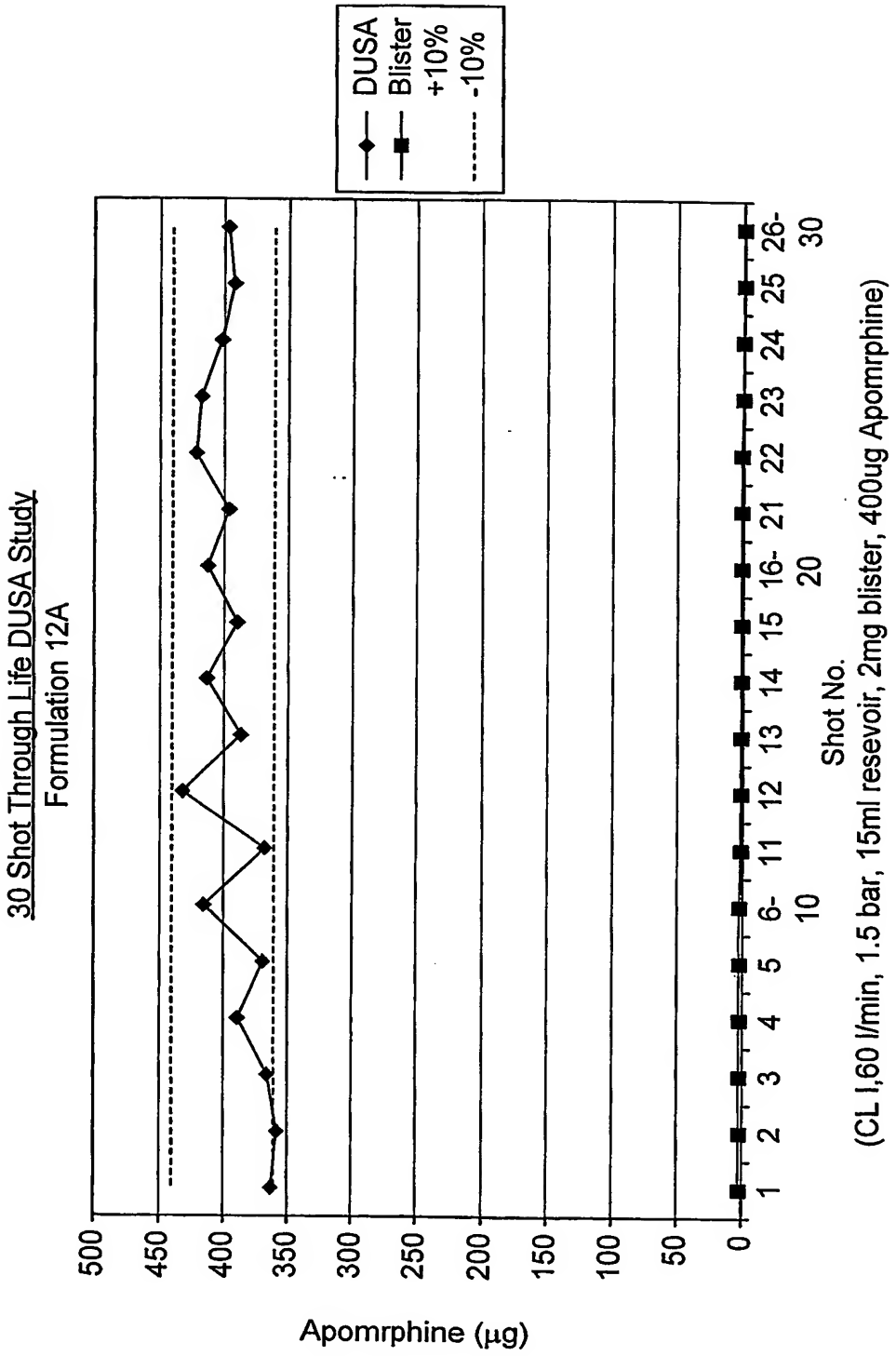

30 Shot Through Life DUSA Study
Formulation 12A
DUSA
Blister
+10%
-10%
Apomrphine (µg)
500
450
400
350
300
250
200
150
100
50
0
1 2 3 4 5 6- 10 11 12 13 14 15 16- 20 21 22 23 24 25 26- 30
Shot No.
(CL I,60 l/min, 1.5 bar, 15ml resevoir, 2mg blister, 400ug Apomrphine)

FIG. 55

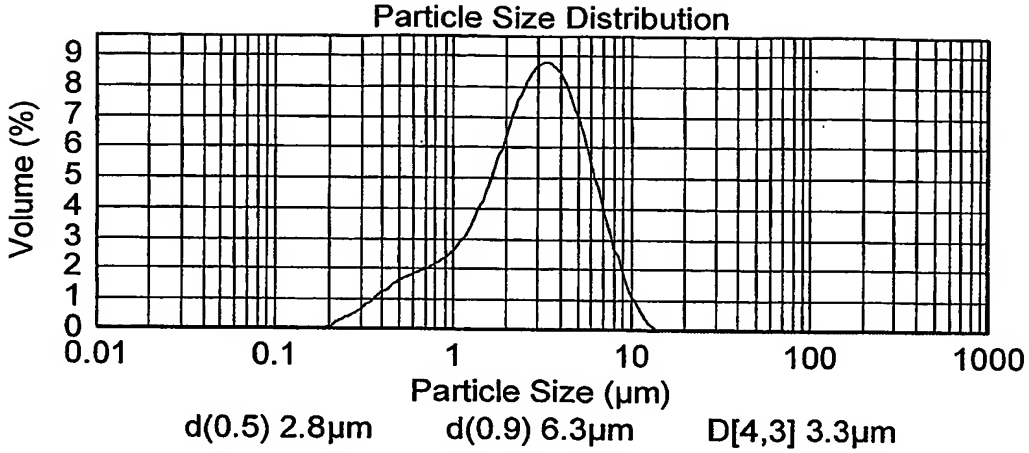

Particle Size Distribution
Volume (%)
0
1
2
3
4
5
6
7
8
9
0.01
0.1
1
10
100
1000
Particle Size (µm)
d(0.5) 2.8µm
d(0.9) 6.3µm
D[4,3] 3.3µm

FIG. 56

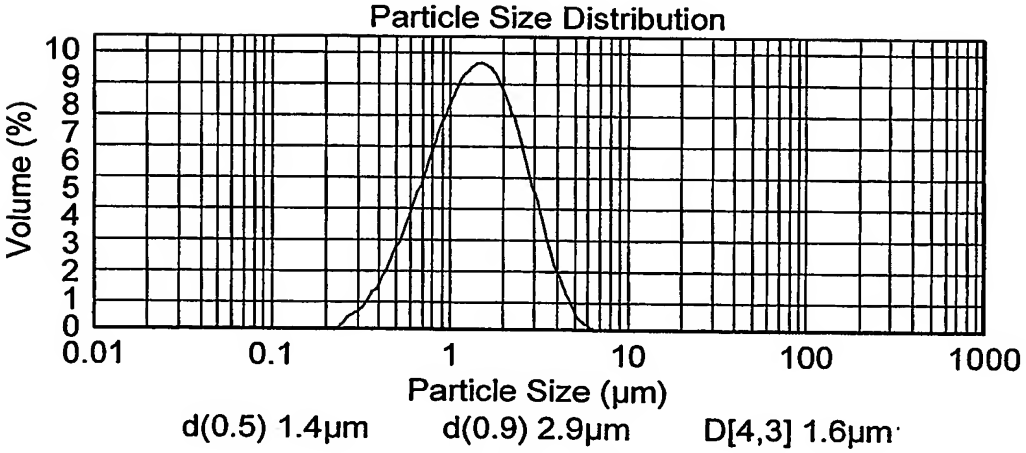

Particle Size Distribution
Volume (%)
0
1
2
3
4
5
6
7
8
9
10
0.01
0.1
1
10
100
1000
Particle Size (µm)
d(0.5) 1.4µm
d(0.9) 2.9µm
D[4,3] 1.6µm

FIG. 57

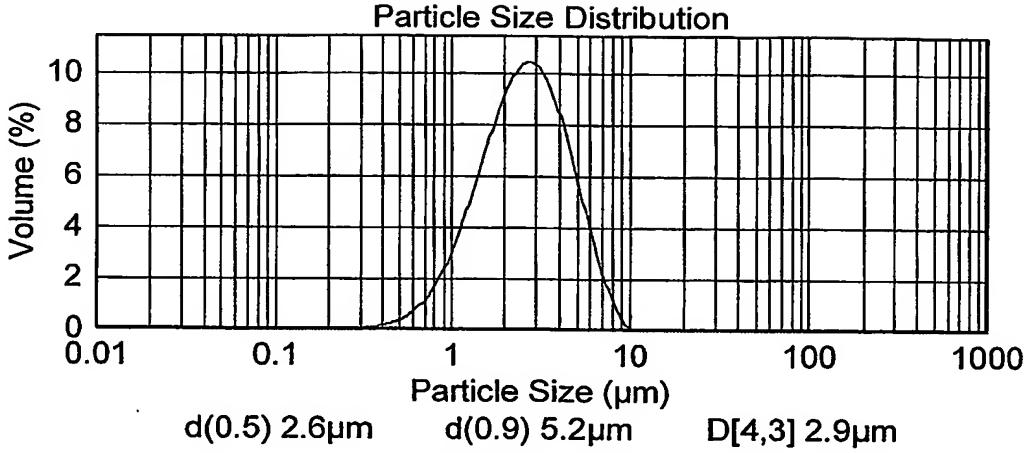

Particle Size Distribution
Volume (%)
10
8
6
4
2
0
0.01
0.1
1
10
100
1000
Particle Size (µm)
d(0.5) 2.6µm
d(0.9) 5.2µm
D[4,3] 2.9µm

FIG. 58

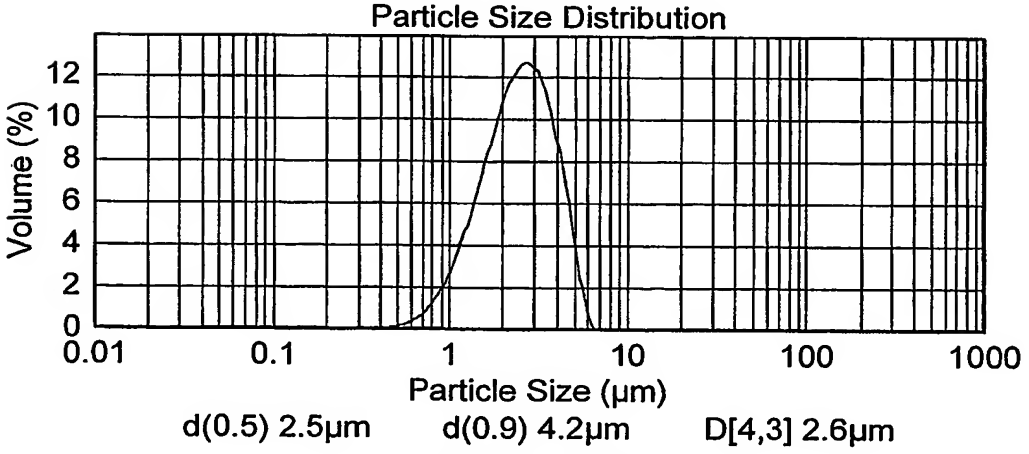

Particle Size Distribution
Volume (%)
12
10
8
6
4
2
0
0.01
0.1
1
10
100
1000
Particle Size (µm)
d(0.5) 2.5µm
d(0.9) 4.2µm
D[4,3] 2.6µm

FIG. 59

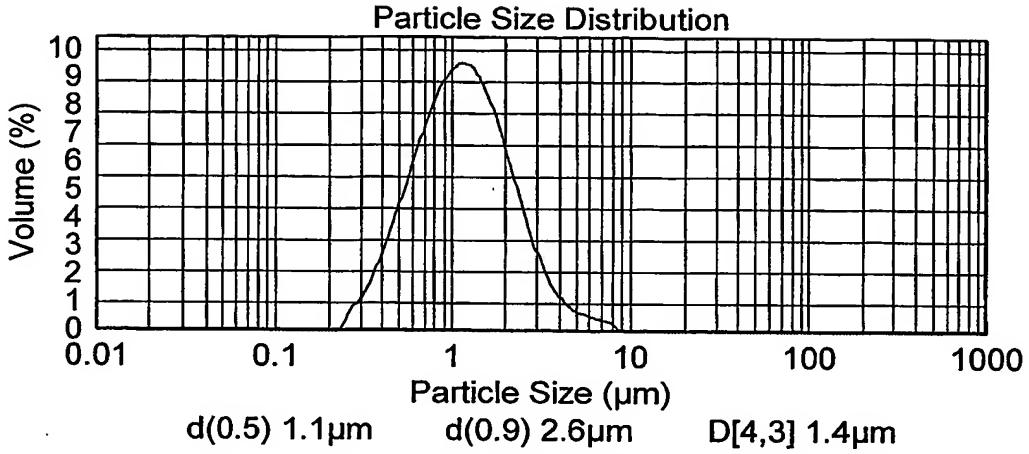

Particle Size Distribution
Volume (%)
10
9
8
7
6
5
4
3
2
1
0
0.01
0.1
1
10
100
1000
Particle Size (µm)
d(0.5) 1.1µm
d(0.9) 2.6µm
D[4,3] 1.4µm

FIG. 60

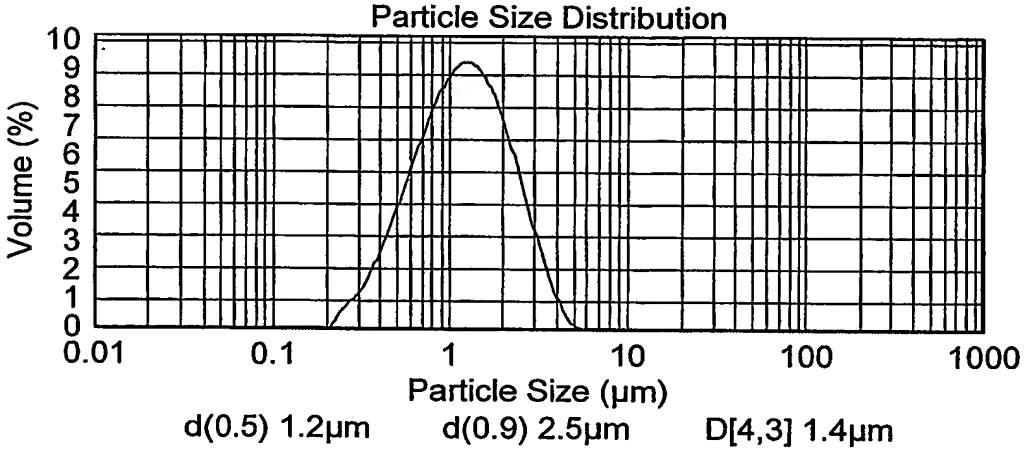

Particle Size Distribution
Volume (%)
10
9
8
7
6
5
4
3
2
1
0
0.01
0.1
1
10
100
1000
Particle Size (µm)
d(0.5) 1.2µm
d(0.9) 2.5µm
D[4,3] 1.4µm

FIG. 61

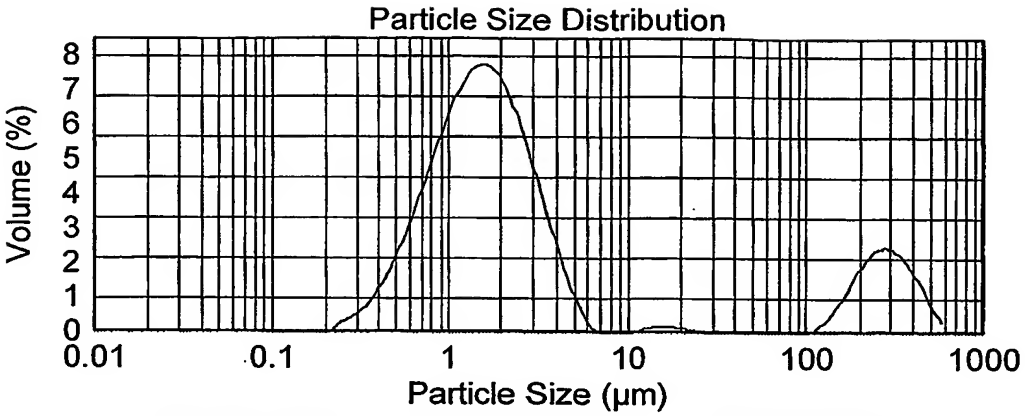

Particle Size Distribution
Volume (%)
0
1
2
3
4
5
6
7
8
0.01
0.1
1
10
100
1000
Particle Size (µm)
d(0.5) 1.8µm
d(0.9) 243.6µm
D[4,3] 38.0µm

FIG. 62

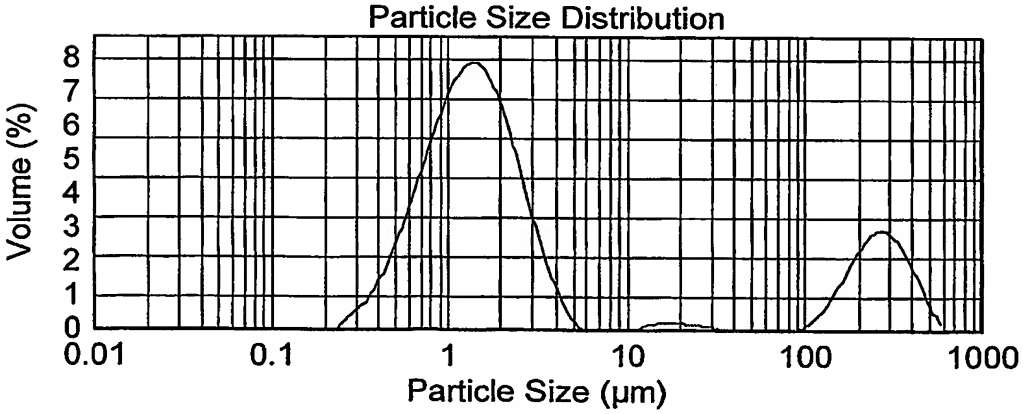

Particle Size Distribution
Volume (%)
0
1
2
3
4
5
6
7
8
0.01
0.1
1
10
100
1000
Particle Size (µm)
d(0.5) 1.6µm
d(0.9) 261.0µm
D[4,3] 55.8µm

FIG. 63

Formulation Details 5000	Uniformily of Delivered Dose 6000 (DUSA, n=10)					Fine Particle Performance (<5mm Cut-Off) 7000 MSLI (ACI)								
	Drug Retention 6010		6015 DD (µg)	6020 Metered (µg)	6025 Mass Balance (µg)	7005 n=	Drug Retention 7010		7015 DD (µg)	7020 FPD (µg)	7025 FPF (%)	7030 Metered	7035 Mass Balance (µg)	7036 Test Flow Rate (L min^{-1})
	Blister (µg) 6012	Device (µg) 6013					Blister (µg) 6012	Device (µg) 6013						
100µg 45-63µm Inversina	7.2	4.3	84	95	93	3 (1)	7.7 (7.5)	7.5 (7.2)	85 (76)	56 (52)	66 (68)	100 (91)	95 (88)	95 (95)
100µg 45-63µm Air Jet Inversina	7.3	3.6	85	95	92	3	4.4	5.7	82	55	66	92	89	95
100µg 45-63µm Grindomix	Not Done					3	6.9	8.6	78	39	50	93	94	95
100µg 50-63µm Air Jet Grindomix	Not Done					3	5.4	6.3	86	40	47	97	96	95
100µg 45-63µm Air Jet Grindomix	Not Done					3	4.2	9.4	83	52	62	97	92	95
200µg UF020100MGA 45-63µm Air Jet Inversation	10.0	5.3	188	203	96	(2)	(7.8)	(14.5)	(175)	(122)	(70)	(197)	(94)	60

FIG. 64A

Formulation Details 5000	Uniformily of Delivered Dose 6000 (DUSA, n=10)				Fine Particle Performance (<5mm Cut-Off) 7000 MSLI (ACI)								
	Drug Retention 6010		Delivered Dose 6015		Metered Dose 6020 (µg)	Mass Balance 6025 (%)	Drug Retention 7010		Delivered Dose µg 7020	Fine Particle		Metered (µg) 7030	Mass Balance (%) 7035
	Blister (µg) 6012	Device (µg) 6013	(µg) 6016	% Nominal 6017			Blister (µg) 6012	Device (µg) 7013		FPD (µg) 7020	FPF (µg) 7505		
100µg 45-63µm Inversina	6.6	7.8	81	81	95	95	8.8	5.6	82	52	64	96	96
200µg 45-63µm t Inversina	12.1	11.5	170	85	194	93	9.8	13.3	175	118	67	198	96
200µg 45-63µm Inversina	9.2 14.5	12.7 8.6	162 169	81 85	184 192	93 96	6.5	15.2	170	105	62	192	96
200µg 45-63µm Inversina	11.0	11.2	171	85	193	95	10.7	14.1	172	117	68	196	96

Test Flow Rate = 60 L Min^{-1}

FIG. 64B

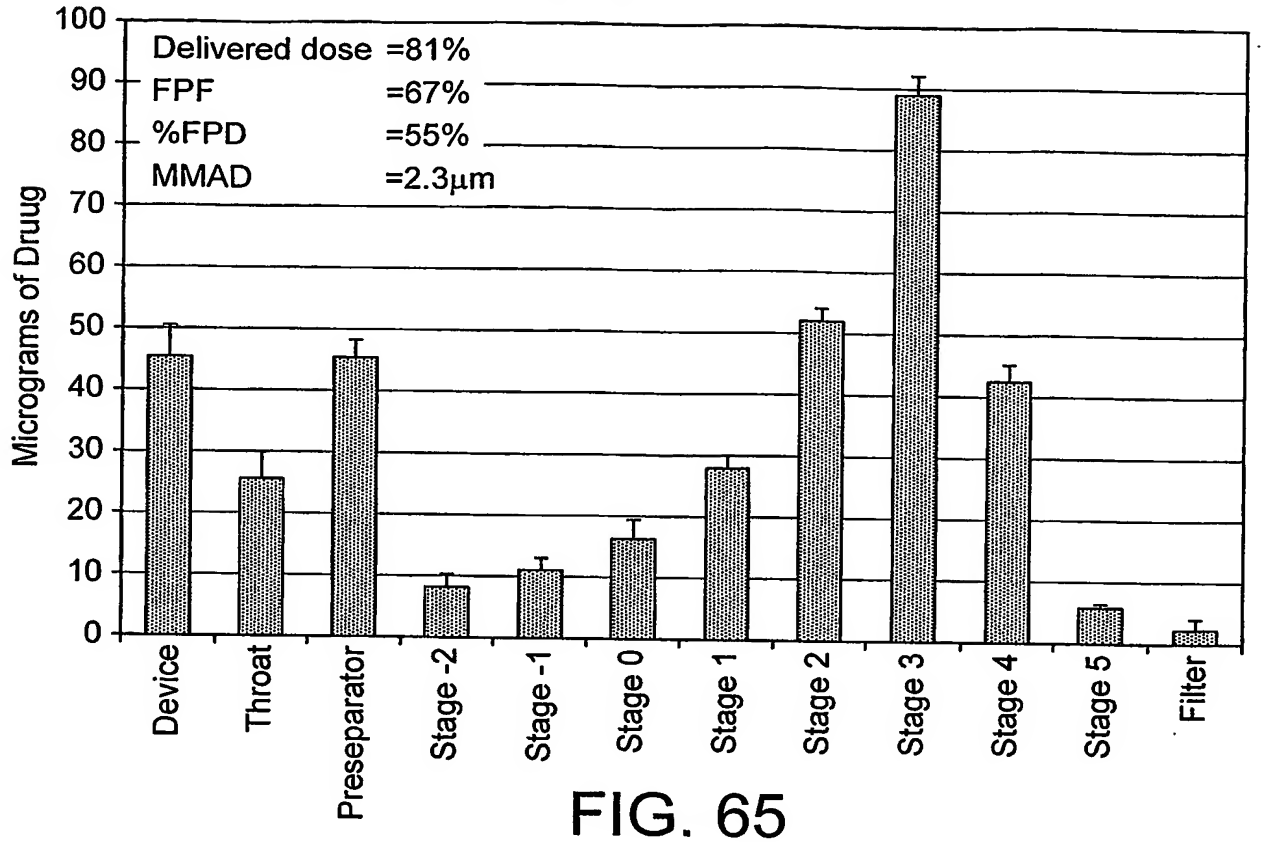

Delivered dose =81%
FPF =67%
%FPD =55%
MMAD =2.3µm
Micrograms of Druug
100
90
80
70
60
50
40
30
20
10
0
Device
Throat
Preseparator
Stage -2
Stage -1
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Filter

FIG. 65

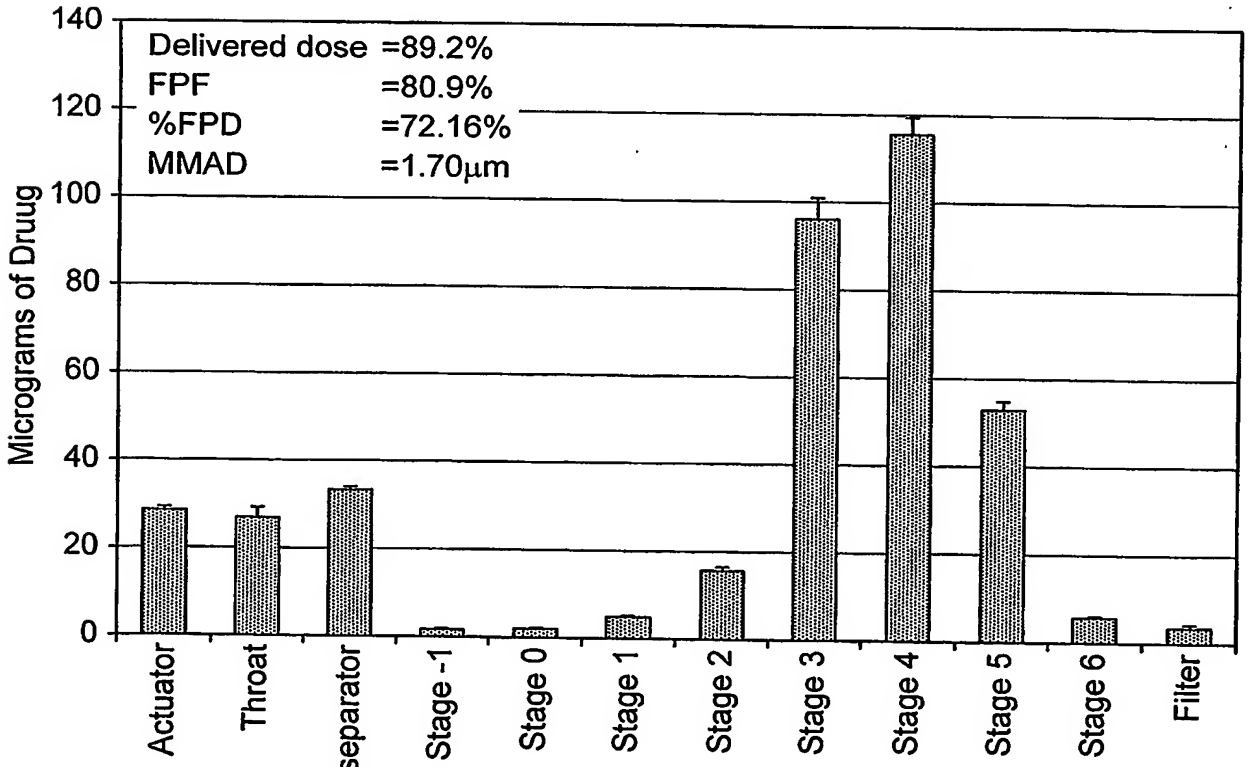

Delivered dose =89.2%
FPF =80.9%
%FPD =72.16%
MMAD =1.70µm
Micrograms of Druug
140
120
100
80
60
40
20
0
Actuator
Throat
Preseparator
Stage -1
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Filter

FIG. 66